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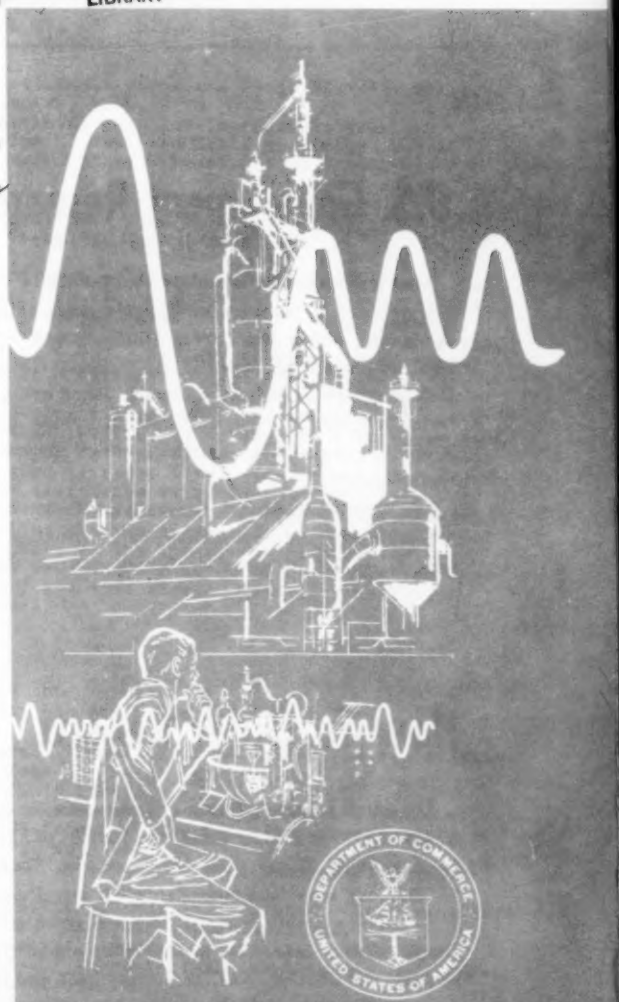

U. S. DEPARTMENT OF COMMERCE
BUSINESS AND DEFENSE SERVICES ADMINISTRATION
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U.S. GOVERNMENT RESEARCH REPORTS

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

BUSINESS AND DEFENSE SERVICES ADMINISTRATION

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TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-256 061 Div. 1, 12, 15
(17 May 61) OTS price $3.60

Stanford U., Calif.
THE OPTIMUM RESPONSE OF FULL THIRD ORDER SYSTEMS WITH CONTACTOR CONTROL,
by I. Flugge-Lotz and H. A. Titus, Jr. 15 Mar 61, 34p. incl. illus. tables. (Technical rept. no. 129)
(Contract AF 49(638)513)
(AFOSR-442) Unclassified report

DESCRIPTORS: *Control systems, *Matrix calculus, Mathematical analysis.

In the full third order problem it was desirable to modify the iteration procedure used in the periodic approximation method that was developed in solving the optimum problem of the second-order velocity controlled system. A number of examples illustrate the new method. The examples were first constructed in reverse time by employing the true optimum switching times satisfying the optimum switching function which was developed by the methods of Pontrjagin. The obtained final values of error and error derivatives gave the initial values for the approximate method. Periodic approximations of the optimum switching times were then obtained. It was found that for less than three switchings the approximate method leads to identical results. Reasonably small differences occur when three or more switchings are needed to reduce the initial disturbance to zero. (Author)

AD-256 073 Div. 1, 12, 28
(18 May 61) OTS price $1.75.

National Aeronautics and Space Administration, Washington, D. C.
FLIGHT CONTROLLABILITY LIMITS AND RELATED HUMAN TRANSFER FUNCTIONS AS DETERMINED FROM SIMULATOR AND FLIGHT TESTS,
by Lawrence W. Taylor, Jr., and Richard E. Day. May 61, 65p. incl. illus. tables, 13 refs. (Technical note D-746)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-746.

DESCRIPTORS: Flight testing, Control systems, *Human engineering, *Control, Damping, *Stability, *Flight simulators, Functions, Training devices, Analog computers, Roll, *Pilots, Pitch, Aerodynamic configurations, Yaw, Aircraft, Learning, Attitudes, Satellite vehicles, Manned, Jet fighters, *Control simulators, Flight,

A simulator study and limited flight tests were performed to determine the levels of static stability and damping necessary for pilot control of the pitch, roll, and yaw attitudes of a vehicle for a short period of time. Novel piloting techniques were found which enabled the pilot to control the airplane at conditions that were otherwise uncontrollable. The influence on the controllability limits of the more important aerodynamic coefficients and other factors, such as learning and interruption of the pilot's display, was also investigated. Information concerning human transfer functions applicable to marginally controllable tasks is presented which should aid in assessing the controllability of any specific configuration. (Author)

AD-256 074 Div. 1, 9
(18 May 61) OTS price $0.50

National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMICS OF A FAN-IN-FUSELAGE MODEL,
by Ralph L. Maki and David H. Hickey. May 61, 14p. incl. illus. (Technical note D-789)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-789.

DESCRIPTORS: *Vertical take-off planes, Control, Tests, Stability, Fuselages, Wings, Model tests, Wind tunnels, *Aerodynamics, Landing, Lift, Jet propulsion, Model tests, Flight speeds, Flight testing, Wind tunnel models, Shrouded propellers.

A large-scale model with an unswept wing and a high disk-loading fan mounted in a fuselage duct was tested in the wind tunnel. The test results were used to study transition flight characteristics associated with the submerged fan concept. The fan produced a large pitching-moment variation with increasing forward speed. Proper programing of the transition flight plan required the use of wing flaps, variable angle of attack, and some direct propulsive thrust. (Author)

AD-256 106 Div. 1
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE YAK-18 STORY.
10 Nov 60, 5p. incl. illus. table. (Trans. no. MCL-338 from Przeglad Lotnictwa Sportovego, pp. 1-2, May 1959)
Unclassified report

DESCRIPTORS: *Training planes, Landing gear, *USSR, Airplane engine cowlings, Radio compasses, Hydraulic systems, Propeller blades, Technological intelligence, Cockpits, Instrumentation.

The USSR training airplane YAK-18 is discussed. A short history is given of the changes made on this airplane over the past twelve years; these comprise landing gear changes, cowling modification, cockpit modernization, and instrumentation improvements. A new hydraulically steered adjustable propeller completes the roster of changes.

Division 1 - AIRCRAFT AND FLIGHT EQUIPMENT

AD-256 426 Div. 1
(22 May 61) OTS price $4.60

Vertol Div., Boeing Airplane Co., Morton, Pa.
FLIGHT TEST EVALUATION OF AN IMPROVED EXTERNAL CARGO SLING SYSTEM FOR H-34 HELICOPTERS.
Jan 61, 50p. incl. illus. (Rept. no. R-237)
(Contract DA 44-177-tc-587, Proj. 9R89-02-015-14)
(TREC TR 61-40) Unclassified report

DESCRIPTORS: *Helicopters, Flight testing, Aircraft equipment, Stability, *Helicopter hoists, Pellets, Cargo, Handling.

A test configuration of an improved external cargo sling for a single rotor helicopter herein called cargo swing has been designed, manufactured, and flight tested on an H-34 by Vertol Division, Boeing Airplane Company. Pilot comments indicated that, when carrying various loads, the swing resulted in a substantial improvement in aircraft handling characteristics as compared to the standard sling configuration. The pilot effort required to control the helicopter when using the swing was considerably less than that required under identical conditions with the standard cargo sling. (Author)

AD-256 455 Div. 1
(24 May 61) OTS price $6.60

Convair, San Diego, Calif.
F-106 FLIGHT TEST OPERATIONS,
by R. V. Minutello. Summary rept. 1 Mar 61, 66p. incl. illus. tables (Rept. no. ZC-8-652-18)
(Contracts AF 33(600)30169, AF 33(600)36714 and AF 33(600)40599)
Unclassified report

DESCRIPTORS: *Jet fighters, Fighters, Jet planes, Jettisonable equipment, Ejection seats, Airplane landings, Flutter, Fatigue (Mechanics), Turbojet engines, All weather aviation, Armament, Guided missiles, Air to air, Electrical equipment, Control systems, Jet engine inlets, Structures, Airplane protuberances, Maneuverability, Flight testing, Automatic pilots, Aircraft fire control systems.

A brief summary with results is presented of the Convair flight test program of the F-106 for the time period between 1 January 1959 and the present.

AD-256 476 Div. 1
(23 May 61) OTS price $4.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
LIMITED STABILITY AND CONTROL EVALUATION OF THE S-62A HELICOPTER,
by Kenneth R. Ferrell and Paul J. Balfe. Mar 61, 40p. incl. illus. table. (Rept. no. AFFTC TR 61-8)
Unclassified report

DESCRIPTORS: *Helicopters, Flight testing, Stability, *Amphibian planes, Control, *Control systems, Cockpits, Vibration, Airplane landings, Ground effect, Take-off, Stability (Longitudinal), Stability (Lateral).

The results are presented of a limited stability and control evaluation of the S-62A helicopter. The S-62A is essentially an improved, amphibious, turbine powered model of the H-19 helicpoter and uses many of the same dynamic components. In general, the flying qualities are good. Sideward and rearward flight capabilities are excellent. Controllability about all axis is acceptable and the helicopter is very easy to fly. The major shortcomings in the flying qualities are the high pedal forces and poor dynamic lateral-directional stability during climb. Over-all vibration levels are very low for all flight conditions tested. (Author)

AD-256 505 Div. 1
(23 May 61) OTS price $0.75

National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATION OF WATER-POND ARRESTING OF A DYNAMIC MODEL OF A JET TRANSPORT,
by William C. Thompson. May 61, 23p. incl. illus. tables (NASA Technical note D-732)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-732.

DESCRIPTORS: Jet planes, Commercial planes, *Arresting gear, Model tests, *Airplane landings, *Landing impact, Landing mats, Water entry, Plastic coatings, Landing aids, *Aviation safety, Transport planes, Lakes, Runways, Take-off, Test methods, Test equipment, Landing gear.

An investigation was made to obtain data which would aid in determining the practicability of using a water-pond arresting system for airplane runway overrun. Tests were made with several water-pond configurations, water depths, and airplane entry speeds. The water pond could stop the model for most of the test conditions, although there was some damage to the model at the higher water entry speeds. (Author)

AD-256 510 Div. 1, 16
(25 May 61) OTS price $2.60

Army Board for Aviation Accident Research, Fort Rucker, Ala.
PHYSIOLOGICAL FACTORS IN ARMY AIRCRAFT ACCIDENT CAUSATION.
1958-60. 1961, 20p. incl. tables (Rept. no. HF 2-61)
Unclassified report

DESCRIPTORS: *Aviation accidents, Aviation safety, Physiology, Aviation medicine, Pilots, Stress (Physiology), Fatigue (Physiology), Visual perception, Nutrition, Aircraft.

Of the 1063 major aircraft accidents experienced by the Army during the period 1 July 1957-30 June 1960, 961 of these accidents indicated unsafe acts by operators, supervisors, or maintenance personnel. The findings indicate a significant proportion of the unsafe acts (85%) were committed by the aircraft operator (pilot). The findings further indicate that physiological factors were involved in approximately 8% of all major accidents, and 10% of all pilot factor accidents. Flight Surgeon Reports of Army Aircraft Accidents mentioned 130 physiological factors present, to one degree or another, in 88 major accidents. Frequency of physiological factors which were either established or suspected in accident causation indicate four conditions which should be noted. These are: (1) Disorientation, (2) Fatigue, (3) Visual Misperceptions, (4) Dietary deficiencies. Disorientation, fatigue, and visual misperceptions appear to be approximately three times more likely during rotary wing flight as compared to conventional fixed wing flight.

AD-256 531 Div. 1, 30
(23 May 61) OTS price $11.50

Wichita U. School of Engineering, Kans.
SHROUDED PROPELLER INVESTIGATIONS: WIND TUNNEL TESTS OF A 4-BLADED SHROUDED PROPELLER MODEL HAVING A 0.30 HUB/TIP DIAMETER RATIO CENTERBODY, by Vernon O. Hoehne. Mar 61, 247p. incl. illus. table. (Engineering research rept. no. 213-12) (Contract Nonr-20101)
Unclassified report

DESCRIPTORS: *Shrouded propellers, Test equipment, *Wind tunnel models, Tests, Design, Propeller shrouds, Propeller blades.

Wind tunnel tests have been conducted on a shrouded propeller model with two variable pitch blades operating within a 0.50 chord/diameter ratio shroud. The shroud had provisions for changing the inlet configuration from a streamlined or high-speed shape to a flared or bellmouth shape and for mounting either a diffused or non-diffused exit. Seven exit vanes designed to remove the rotational component of jet velocity at design conditions were installed. The centerbody of the model had a 0.3 hub/tip diameter ratio. Performance of the model was measured throughout a range of advance ratios from zero to 2.2 at several blade pitch settings and angles of attack between zero and 90 degrees. Results are presented in the form of force and moment coefficients varying with power coefficient at forward flight conditions, and with propeller tip speed at static flight conditions. (Author)

AD-256 532 Div. 1, 30
(23 May 61) OTS price $10.10

Wichita U. School of Engineering, Kans.
SHROUDED PROPELLER INVESTIGATIONS: WIND TUNNEL TESTS OF A 4-BLADED SHROUDED PROPELLER MODEL HAVING A 0.4 HUB/TIP DIAMETER RATIO CENTERBODY, by Vernon O. Hoehne. Mar 61, 116p. incl. illus. table. (Engineering research rept. no. 213-13) (Contract Nonr-20101)
Unclassified report

DESCRIPTORS: *Shrouded propellers, Test equipment, *Wind tunnel models, Tests, Design, Propeller shrouds, Propeller blades.

Wind tunnel tests have been conducted on a shrouded propeller model with four variable pitch blades operating within a 0.50 chord/diameter ratio shroud and having a 0.4 hub/tip diameter ratio centerbody. The shroud had provisions for changing the inlet configuration from a streamlined or high-speed shape to a flared or bellmouth shape and for mounting either a diffused or nondiffused exit. Seven exit vanes designed to remove the rotational component of jet velocity at design conditions were installed. The design of the propeller blades was identical to the design of the blades used in a model having a 0.3 hub/tip diameter ratio centerbody. A comparison of the test data from these two models shows the effect of centerbody size on shrouded propeller performance. Performance of the model was measured throughout a range of advance ratios from zero to 2.2 at several blade pitch settings and angles of attack between zero and 90 degrees. Results are presented in the form of force and moment coefficients varying with power coefficient for forward flight conditions and with propeller rotation speed and static disc loading at zero speed conditions. (Author)

AD-256 533 Div. 1, 30
(23 May 61) OTS price $8.10

Wichita U. School of Engineering, Kans.
SHROUDED PROPELLER INVESTIGATIONS: PROPELLER TIP CLEARANCE EFFECTS,
by Vernon O. Hoehne and Hans Hoffman. Apr 61, 77p. incl. illus. (Engineering rept. no. 213-15) (Contract Nonr-20101)
Unclassified report

DESCRIPTORS: *Shrouded propellers, Test equipment, *Wind tunnel models, Tests, Design, Propeller shrouds, Propeller blades.

Wind tunnel tests were conducted on a shrouded propeller model in which the propeller diameter was varied for the purpose of measuring the effects of tip to shroud clearance. The basic model tested contained a four-bladed variable pitch propeller operating within a 0.50 chord/diameter ratio shroud. To assist in studying the effect of annulus area on tip clearance, two models having 0.30 and 0.40 hub/tip diameter ratio centerbodies were tested over roughly the same range of propeller tip clearances. Performance of the models was measured throughout a range of advance ratios from zero to roughly 2.20 at several propeller blade pitch settings at zero angle of attack only. Results are presented in the form of force and power coefficients and efficiency varying with propeller tip clearance and rotational speed for forward and static flight conditions. (Author)

AD-256 711 Div. 1
(29 May 61) OTS price $3.60

Marine Corps Landing Force Development Center, Quantico, Va.
USE OF GENERAL LOGISTICS HELICOPTER SLING FOR CARRYING EXTERNAL LOADS BY HELICOPTER.
5 Apr 61, 1v. incl. illus. (Landing Force Information Letter no. 8)
Unclassified report

DESCRIPTORS: *Helicopter hoists, Hooks, Hoists, Design.

General Logistics universal sling is used for carrying external cargo by helicopter. This sling in its normal configuration is a four legged, nylon, adjustable type sling. It weighs approximately 26 pounds and has a rated 10,000 pound lifting capacity with at least 3:1 safety factor. The sling can be disassembled completely and unserviceable components replaced in the field without special tools or training. (Author)

AD-256 736 Div. 1
(31 May 61) OTS price $2.60

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF SA-16 AIRPLANE FOR PARACHUTE DELIVERY OF PERSONNEL, SUPPLIES, AND EQUIPMENT.
5 May 61, 18p. incl. illus. (Proj. no. ATB 3-310)
Unclassified report

DESCRIPTORS: *Parachute descents, Personnel, Aircraft equipment, Arctic regions, Supplies, Reliability, *Airplanes, Tests, Military equipment, Parachute jumping, *Flying boats, Air drop operations.

This test investigated only the suitability of the SA-16 Airplane for Parachute Delivery of Personnel, Supplies, and Equipment. Tests were conducted in a temperature range of 8 F to -9 F, utilizing personnel equipped with full arctic

combat equipment for jumps. Testing pertaining to parachute delivery of personnel, supplies, and equipment was accomplished by personnel wearing full arctic clothing, to include the arctic mitten set. The test airplane was satisfactory with respect to: (a) physical characteristics, (b) safe jump procedures, (c) parachute delivery of personnel when the parachutists' individual equipment containers did not exceed 24 inches in length or 65 pounds in weight, (d) parachute delivery of supplies and equipment, (e) consecutive parachute delivery, (f) provisions and procedures for emergencies, and (g) towed parachutist procedures. The test airplane was unsatisfactory with respect to parachute delivery of personnel when the parachutists' individual equipment containers exceeded 24 inches in length or 65 pounds in weight. (Author)

AD-256 772 Div. 1, 9
(31 May 61) OTS price $1.25

National Aeronautics and Space Administration, Washington 25, D. C.
APPLICATIONS OF POWER SPECTRAL ANALYSIS METHODS TO MANEUVER LOADS OBTAINED ON JET FIGHTER AIRPLANES DURING SERVICE OPERATIONS,
by John P. Mayer and Harold A. Hamer. May 61. 50p, incl. illus, tables, 12 refs. (NASA Technical note no. D-902, supersedes NACA RM L56J15, AD-119 303)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-902.

DESCRIPTORS: Maneuverability, Load distribution, *Jet fighters, Jet planes, Statistical analysis, Probability, Mathematical analysis, Fighters.

Power spectral densities of normal load factor were obtained for two service operational training flights of an F-84G airplane and three service operational training flights of an F-86A airplane to indicate the load-factor frequency content and possible uses of power spectral methods in analyzing maneuver load data. It was determined that the maneuvering load-factor time histories appeared to be described by a truncated normal distribution. The power spectral densities obtained were relatively level at frequencies below 0.03 cycles per second and varied inversely with approximately the cube of the frequency at the higher frequencies. In general, the frequency content was very low above 0.2 cycles per second. The load-factor peak distributions were estimated fairly well from the spectrum analysis. In addition, peak load data obtained during service operations of fighter-type airplanes with flight time totaling about 24,000 hours were examined and appeared to agree reasonably well with the type of equations obtained from spectrum peak-load distributions. (Author)

AD-256 773 Div. 1, 9
(31 May 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
EFFECT AT HIGH SUBSONIC SPEEDS OF FUSELAGE FOREBODY STRAKES ON THE STATIC STABILITY AND VERTICAL-TAIL-LOAD CHARACTERISTICS OF A COMPLETE MODEL HAVING A DELTA WING,
by Edward C. Polhamus and Kenneth P. Spreemann. May 61. 32p. incl. illus. tables. (NASA Technical note no. D-903; supersedes NACA RM L57K15a, AD-151 604)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-903.

DESCRIPTORS: Aerodynamics, *Triangular wings, *Stability, *Tails, Aerodynamic configurations, *Load distribution, Fuselages, Tests.

In the present investigation, tests were made at Mach numbers from 0.60 to 0.92 corresponding to Reynolds numbers from 3,000,000 to 4,200,000, based on the wing mean aerodynamic chord, and at angles of attack from approximately -2 degrees to 24 degrees. The results indicated that the strakes provided improvements in the directional stability characteristics of the wing-fuselage configuration. These improvements were reflected in the characteristics of the complete model in the angle-of-attack range where losses in directional stability frequently occur. (Author)

AD-256 791 Div. 1
(29 May 61) OTS price $11.50

Air Force Flight Test Center, Edwards Air Force Base, Calif.
YHC-1A FLIGHT EVALUATION,
by Charles C. Crawford and Walter J. Hodgson. Feb 61, 149p. incl. illus. tables (Rept. no. AFFTC TR 61-1)
Unclassified report

DESCRIPTORS: *Helicopters, Transport planes, *Flight testing, Stability, Vibration, Aerodynamics, Take-off, Landing, Test methods, Control, *Tests, Gas turbines.

AD-256 818 Div. 1
(1 June 61) OTS price $1.60

Army Arctic Test Board, Fort Greely, Alaska.
SERVICE TEST OF AIRCRAFT MAINTENANCE WORKSTAND S-3.
9 May 61, 1v. incl. illus. 14 refs. (Proj. no. ATB-4-51)
Unclassified report

DESCRIPTORS: *Maintenance equipment, *Aircraft equipment, Arctic regions, Tests, Climatic factors, Reliability, Maintenance, Military equipment.

The test workstand was used in the normal maintenance of seven different Army aircraft for a period of four months. Ambient temperatures during the test period ranged from 19 F to -35 F. The test workstand was satisfactory with respect to physical characteristics, functional suitability, and maintenance. The test workstand was satisfactory with respect to reliability and durability at ambient temperatures below -15 F. The test workstand was readily towed by a 1/4-ton truck, easily manhandled, and was stable when stability jacks were extended. No adverse safety features were encountered and erection time required approximately 6 minutes. It is concluded that the Aircraft Maintenance Workstand S-3 should be suitable for Army use under arctic winter conditions when the deficiency listed has been corrected. (Author)

AD-256 851 Div. 1, 10, 12, 26
(31 May 61) OTS price $8.10

Frankford Arsenal, Philadelphia, Pa.
A BASIC INVESTIGATION OF CONTROLLABLE THRUST DEVICES FOR ESCAPE FROM SPACE VEHICLES,
by Charles W. Boaz. Summary rept. on Phase 1, pt. 1, vol. 1, Mar 59-Apr 60. Jan 61, 71p. incl. illus. tables, 23 refs. (Rept. no. R-1547) (WADD TR 60-348)
Unclassified report

DESCRIPTORS: Explosive actuators, Design, Propellants, *Spaceships, *Jettisonable cockpits, *Jettisonable equipment, High altitude, Thrust, *Control systems, Space environmental conditions, *Ejection seats, Solid rocket propellants, Liquid rocket propellants, Gaseous rocket propellants, Theory, Hydraulic systems, Rocket planes, Cartridges, Ejector cartridges, Hypervelocity vehicles.

The control of thrust from propellant actuated devices (PAD's) used for escape from space vehicles was investigated. Repetitive start-stop operations and control or thrust rate and direction were considered for gaseous, liquid, solid, and mechanical systems, with respect to the problems of operating in the environmental zone bounded by altitudes of 75,000 and 300,000 ft. Of the various methods studied for controlling thrust rate, hydraulic or pneumatic systems are the least difficult; control in liquid propellant systems is rather flexible; solid propellant systems, which give a uniform, reliable, fixed-type performance, offer good possibilities for control through design of the solid propellant charges. So far as the operation of escape mechanisms is concerned, the problems introduced by environmental conditions between 75,000 and 300,000 ft were found to differ only slightly from the problems common at lower altitudes. Vacuum effects, ozone concentration, and temperature were the chief factors considered. The need for an examination of the problem of thrust control at altitudes of 200 mi or more was evident. (Author)

AD-256 873 Div. 1, 29
(31 May 61) OTS price $4.60

Aerospace Medical Div., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
PHYSIOLOGY AND OPERATIONAL COMPARISON OF MC-1 AND MC-3 (MC-4) PARTIAL PRESSURE SUITS,
by Terence F. McGuire. Rept. on Development of Pressure Suit Systems. Oct 60, 37p. incl. illus. tables, 138 refs. (Proj. no. 6333)
(WADD TR 57-536, Vol. 1) Unclassified report

DESCRIPTORS: *Pressure suits, Test methods, Physiology, Aviation medicine, Circulatory system, Blood pressure.

A theory on the physiological limitations of partial pressure suits, with supporting evidence, is discussed. Loss of effective blood volume, workload placed on the heart, available oxygen, a number of reflexes that can work separately or together to the individual's disadvantage, and other contributory mechanisms are stressed. The comparative operational characteristics of the MC-1 and MC-3 (MC-4) partial pressure suits are presented. (Author)

AD-256 874 Div. 1
(31 May 61) OTS price $2.60

Aeronautical Systems Div., Air Force Systems Command, Wright-Patterson Air Force Base, Ohio.
ULTRA-FAST OPENING PERSONNEL PARACHUTE TYPE XMP-2,
by Edward J. Murray. April 61, 21p. incl. illus. (Proj. no. 8075; In cooperation with Oerlikon Tool and Arms Corp. of America, Contract AF33(600)33249 and Stencil Aero Engineering Corp., Contract AF33(600)38893)
(WADD TR 60-485) Unclassified report

DESCRIPTORS: *Parachutes, Parachute descents, Tests, Effectiveness, Reliability.

A personnel parachute, with extremely fast opening characteristics, was designed to support testing of two experimental aerial lift devices known as the Hiller Flying Platform and deLackner Aerocycle. Models were designed to operate at airspeeds of near 0 to 50 miles per hour and at altitudes as low as 25 feet above the terrain. This parachute does not possess the reliability required for a personnel parachute. Under certain conditions, it can be used with the flying platform and aerocycle until a more reliable system is developed. Use of this parachute with other aerial vehicles requires further development to improve its reliability. (Author)

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-256 002 Div. 2
(17 May 61) OTS price $1.60

California U., Los Angeles.
LIGHT IN THE ATMOSPHERE,
by Zdenek Sekera. Final rept. Feb 61, 14p.
(Contract AF 19(604)2429)
(AFCRL-435) Unclassified report

DESCRIPTORS: *Light, Scattering, Theory, *Atmosphere, Polarization, *Planetary atmospheres, Measurement, Space environmental conditions, *Meteorology, Surface area, Reflection, *Light transmission, Photomultipliers, *Wave transmission, *Sky brightness.

The main objective in the experimental phase of the research was the modification of a photoelectric polarimeter for the measurement of skylight polarization. A single monochromator, acquired for better calibration, was also used for measurements of the optical thickness of the atmosphere. The monochromator was built into a yoke and provided with a simple sun follower which kept the slit of the monochromator constantly illuminated by sun radiation. By scanning through the entire spectrum, the intensity of the sun radiation in all wavelengths was recorded at suitable time intervals. Then, the optical thickness was determined. In the theoretical aspect of the research, the main emphasis was directed towards the evaluation of the effect of large aerosol particle scattering on the polarization of skylight. Another topic of theoretical research was the effect of ozone absorption. The corrections to the sky radiation from a molecular atmosphere due to ozone absorption were computed with the assumption that the ozone in the atmosphere is concentrated at the top of the atmosphere. Lastly, the computations of the effect of sea surface reflection on skylight were performed. (Author)

AD-256 011 Div. 2
(16 May 61) OTS price $6.60

Florida State U., Tallahassee.
EXTENSION OF A THEORY OF LONG WAVES ON A BAROCLINIC WESTERLY CURRENT,
by William H. Long. 1 June 61, 1v. incl. illus.
(Technical rept. no. 16)
(Contract Nonr-160000, Proj. NR 082-071)
Unclassified report

DESCRIPTORS: *Atmosphere, Motion, *Perturbation theory, Mathematical analysis, Atmosphere models, *Meteorology, *Wind.

An extension of a simplified, quasi-geostrophic, baroclinic theory of long waves set forth by Hess is presented. The ramifications of the stability aspects of the model and the results of adding a form of y-dependence to the system are examined. Finally, a steady state, adiabatic energy equation is added to the model as a diagnostic tool for specifying vertical profiles of the basic westerly current U (p) as a function of the parameters of the problems and as a function of particular vertical temperature profiles. Profiles U (p) for the model proposed by Hess are obtained and investigated as to their physical realism. The analogous profiles for the y-dependent case are not explicitly set forth due to mathematical difficulties. However, their general form is discussed in the light of the prior results of the investigation. (Author)

AD-256 049 Div. 2
(17 May 61) OTS price $2.60

New York U. Coll., of Engineering, N. Y.
THE ENERGY EQUATION OF ATMOSPHERIC MOTIONS IN THE FREQUENCY DOMAIN,
by Wan-Cheng Chiu. Mar 61, 19p. 29 refs.
(Scientific rept. no. 2)
(Contract AF 19(604)6146)
(AFCRL-440) Unclassified report

DESCRIPTORS: Atmospherics, *Atmosphere, Mathematical analysis, *Meteorology, Motion, Energy, *Wind, *Air, Fourier analysis, Integral transforms.

The energy equation of atmospheric motions in the frequency domain is derived by means of Fourier transformation. The spectral equation so derived contains various terms that influence the statistical energy spectrum of atmospheric motions. The physical meanings of these terms are fully discussed. (Author)

AD-256 056 Div. 2
(17 May 61) OTS price $9.60

Arctic Inst. of North America, Montreal (Canada).
METEOROLOGICAL OBSERVATIONS 1957-1958,
ed. by Svenn Orvig. May 61, 1v. incl. tables
(Research paper no. 8)
Unclassified report

DESCRIPTORS: Meteorology, Tables, Humidity, *Meteorological data, Wind, Velocity, Temperature, *Glaciers, Alaska.

A summary is presented of the synoptic observations on the McCall Glacier, from June 13, 1957, to Oct 31, 1957, and from Feb 18 to Aug 18, 1958. The subsequent micro-meteorological data will allow the energy exchange processes of the ablation period to be studied, mainly that of 1958. (Author)

AD-256 062 Div. 2, 8
(17 May 61) OTS price $5.60

Stanford Research Inst., Menlo Park, Calif.
RESEARCH ON VLF PROPAGATION IN ARCTIC REGIONS. GEOPHYSICAL EFFECTS,
by Arthur L. Whitson. Final rept. 1958-1959.
Feb 61, 44p. incl. illus. 37 refs.
(Contract AF 19(604)7250)
(AFCRL-124) Unclassified report

DESCRIPTORS: Very low frequency, *Propagation, *Radio waves, Atmospherics, Arctic regions, Ionospheric propagation, Geophysics, Noise analyzers, Solar noise, Solar disturbances, Solar flares, Extremely low frequency, Ionospheric disturbances, Measurement.

Atmospheric noise data collected in the Arctic were used to determine certain geophysical effects on VLF propagation between 3 and 30 kc in arctic regions. The effect of sudden ionospheric disturbances in the form of a sudden enhancement of atmospherics is defined in the 3 to 30 kc frequency band. Very-low-frequency propagation along the Fairbanks-Thule great-circle path, as measured by Fourier analysis of atmospherics, is non-reciprocal but disagrees with non-reciprocal measurements at mid-latitudes. The influence of a polar-cap-absorption event on atmospheric noise is shown, along with variations in atmospheric noise spectrum that are related to some unexplained VLF propagation phenomena. (Author)

AD-256 079 Div. 2
(18 May 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
STUDY OF THE USE OF A TERMINAL CONTROLLER TECHNIQUE FOR REENTRY GUIDANCE OF A CAPSULE-TYPE VEHICLE,
by Edwin C. Foudriat. May 61, 29p. incl. illus.
(Technical note D-828)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-828.

DESCRIPTORS: *Re-entry vehicles, Equations, *Atmosphere entry, Control systems, Flight paths, Differential equations, Guidance, Satellite vehicle trajectories, Landing, Mathematical analysis, Taylor's series.

A study was made of the use of a terminal controller technique in the guidance of a capsule-type reentry vehicle to a desired landing point. Two-degree-of-freedom equations are used to describe the vehicle dynamics. The guidance system continuously predicts the final error in the range traveled. The predicted error is used to control the angle of attack in an on-off manner. The results indicate control to within 1 degree in range over the total range capability of the vehicle and a minimum number of control corrections. (Author)

AD-256 087 Div. 2, 25
(18 May 61) OTS price $1.60.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SCIENTIFIC NOTES OF THE LVOV IVAN FRANKO STATE UNIVERSITY, COLLECTED WORKS ON ASTRONOMY (SELECTED ARTICLES) (Uchenyye Zapiski L'vovskogo Gosudarstvennogo Universiteta imeni Ivana Franko, Astronomicheskiy Sbornik)
by M. S. Eygenson. 9 Nov 60, 14p. incl. illus.
(Trans. no. MCL-53 from Astronomicheskiy Sbornik 32:66-69; 70-72, 1954)
Unclassified report

DESCRIPTORS: *Solar disturbances, Lakes, Solar atmosphere, *Atmosphere, *Earth, *Precipitation, Sunspots, Solar flares, USSR, *Hydrology.

Contents:
Problem concerning the nature of the solar cycle
Fluctuations in the level of Lake Victoria and the 5 to 6-year cycle of solar activity.

AD-256 088 Div. 2
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SUPERCORONA OF THE SUN,
by V. V. Vitkevitch and P. N. Lebedev. 9 Nov 60, 14p. incl. illus. (Trans. no. MCL-62 from Priroda 46:15-20, 1957)
Unclassified report

DESCRIPTORS: Solar atmosphere, *Solar corona, Electromagnetic waves, Spectrographic analysis, Ionization, Radio astronomy, Astrophysics, *Sun, Gas ionization, *Solar spectrum, *Extraterrestrial radio waves.

AD-256 089 Div. 2, 25
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PRELIMINARY RESULTS OF THE OBSERVATIONS OF THE TOTAL SOLAR ECLIPSE OF JUNE 30, 1954,
by E. R. Mustel and V. V. Vitkevich. 9 Nov 60, 13p. incl. illus. (Trans. no. MCL-72 from Vestnik Akademii Nauk SSSR, 25:25-32, 1955)
Unclassified report

DESCRIPTORS: *Sun, Astronomy, Earth, Solar atmosphere, *Solar eclipse, USSR, Atmosphere, Solar corona, Astrophysics, Physical properties, *Solar spectrum.

AD-256 093 Div. 2, 25
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONCERNING THE PROBLEM ON THE ELECTRON DENSITY OF SOLAR CORONA, (K Voprosu Ob Elektronnoy Plotnosti Solnechnoy Korony)
by Ye Ya. Bugoslavskaya. 15 Nov 60, 2p. (Trans. no. MCL-227 from Astronomicheskiy Tsirkulyar, pp. 8-9, 1955)
Unclassified report

DESCRIPTORS: *Solar corona, *Electrons, USSR, Density.

AD-256 161 Div. 2, 3, 12
(22 May 61) OTS price $3.60

Geophysics Corp. of America, Bedford, Mass.
DEVELOPMENT AND TESTING OF IGNITION SYSTEM FOR ROCKET-BORNE SODIUM VAPORIZER,
Nov 60, 33p. incl. illus. tables. (GCA Technical rept. no. 60-1-N)
(Contract NAS5-215)
Unclassified report

DESCRIPTORS: *Igniters, *Ignition systems, Explosives, Pyrotechnics, Thermochemistry, Pellets, *Thermite, Tests, Seals, Rockets, *Sodium, Vaporization, Upper atmosphere, Flares, Booster rockets, Meteorology, Wind.

The ignition failure of two thermite vaporizer payloads, resulted in an investigation of the ignition parameters of the systems. It was quickly determined that the basic starter thermite ignition system depended upon the integrity of the vaporizer seals and would fail at low pressure. A self-pressurizing ignition system was therefore devised which would be initiated at ambient pressure in order to avoid the seal problem. A commercial hermetically-sealed igniter is used to initiate a large booster which, in turn, initiates the main charge. Limited venting is provided for both booster and canister. The system was test-fired sucessfully at 3 mm Hg after vibration and shock tests. Canister pressure measurements indicated the ignition sequence to be independent of ambients below 3 mm Hg. It is concluded that the ignition system now developed will prove reliable, (Author)

AD-256 162 Div. 2, 12
(22 May 61) OTS price $2.60

Geophysics Corp. of America, Bedford, Mass.
UPPER ATMOSPHERIC WIND PROFILES DETERMINED FROM THREE ROCKET EXPERIMENTS,
by E. Manring, J. Bedinger, and others. Feb 61, 25p. incl. illus. (GCA Technical rept. no. 61-1-N)
(Contract NAS5-215)
Unclassified report

DESCRIPTORS: *Upper atmosphere, *Wind, Rockets, Sodium, Test equipment, Flight testing, Thermite, Ionosphere, Velocity, *Meteorological data, Measurement, Flares, Photography, *Booster rockets, Vaporization.

The first Nike-Asp rocket used as a research vehicle, was fired during the morning twilight on 17 August 1959, the second during the evening twilight on 18 November 1959, and the third during the evening twilight of 24 May 1960. The rocket uses a sodium generator which consists of a canister or vaporizer filled with thermite intimately mixed with metallic sodium pellets, and employed thermal squibs to ignite the mixture upon signal from a timer unit. This generator released an essentially continuous filament of atomic sodium vapor along the rocket trajectory from about 80 km to the rocket zenith and over part of the downward leg. The observations were obtained in the form of photographs taken simultaneously from four stations surrounding Wallops Island. Measured wind profiles for the height interval of 80 to 200 km describe the vector magnitude and direction of the horizontal winds as a function of height. A vertical motion downward is deduced from the data for 18 November 1959 in the height interval of 107 to 111 km. (Author)

AD-256 237 Div. 2, 8
(19 May 61) OTS price $4.60

Research and Advanced Development Div., AVCO Corp., Wilmington, Mass.
RELATION BETWEEN IONOSPHERIC AND GEOMAGNETIC STORMS,
by Gerald F. Rourke. Scientific rept. no. 10 on Research Concerning Forecasting Anomalous Propagation at High Latitudes. Feb 61, 42p. incl. illus. tables (Technical rept. no. RAD-TR-61-15)
(Contract AF 19(604)4092)
(AFCRL TN 61-148) Unclassified report

DESCRIPTORS: *Ionospheric disturbances, *Solar flares, Atmospheric electricity, Magnetic storms, *Terrestrial magnetism, *Radio waves, Absorption, Electromagnetic waves, Analysis, Storms, Arctic regions, *Electromagnetic wave reflections, Northern hemisphere, Meteorological charts, Aurorae, *Propagation.

Analysis was made of the variations of the minimum frequency reflected from the ionic regions (fmin) and the horizontal geomagnetic component in a short-time interval preceding and following 21 sudden-commencement (SC) geo-

magnetic storms. The relative energy levels of the plasma clouds ejected from the sun are estimated from the variations of the geomagnetic field following a sudden commencement. High-energy clouds are found to be associated with pre-SC increases in fmin and the horizontal component. Post-SC variations in fmin strongly depend on the magnitude of geomagnetic activity. The polar cap absorption and geomagnetic disturbance accompanying the storms of 13 and 29 September 1957 are analyzed in detail. (Author)

AD-256 246 Div. 2
(19 May 61) OTS price $4.60

Duke U., Durham, N. C.
STRESS-STRAIN CHARACTERISTICS OF FINE GRAINED SOILS,
by W. H. Gardner, Jr. Summary rept. 1 Mar 61, 47p. incl. illus.
(Contract DA 36-034-ORD-2792)
(OOR rept. no. 2203:3) Unclassified report

DESCRIPTORS: *Soils, Stresses, Creep, Civil engineering.

Some results of constant rate of deformation, creep under constant effective normal stress, and relaxation triaxial tests are described. All tests were made on saturated remolded samples of clay. On the basis of these results and results by others described in the references, a tentative rheological model that is in qualitative agreement with the results is proposed. The proposed model is a first approximation to a more accurate model and is meant to serve as a useful means of visualizing stress-strain behavior of soils. The model described in this report does not take into account the dilatant and thixotropic properties of soils. (Author)

AD-256 311 Div. 2, 30
(19 May 61) OTS price $8.60

Laboratory of Climatology, Centerton, N. J.
MEASUREMENT OF VERTICAL WINDS IN TYPICAL TERRAIN,
by C. W. Thornwaite, W. J. Superior and others. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61. Apr 61, 92p. incl. illus. tables. (Rept. no. 3)
(Contract DA 36-039-sc-84940, Proj. 3A99-07-001-03)
Unclassified report

DESCRIPTORS: *Wind, Vertical indicators, Measurement, *Vertical gust recorders, Terrain, Instrumentation, Mobile, Velocity, *Anemometers.

The development is described of a sensitive anemometer to measure the vertical motion of the air and its use in determining the vertical winds over typical terrains is explained. The use of the vertical anemometer as part of a flux meter system to determine the eddy transport of momentum, sensible heat, and moisture near the earth's surface is discussed. The sensor consists of a three-bladed windmill which will turn at a rate proportional to the magnitude of the vertical component of the wind and which responds equally to updrafts and downdrafts. The vertical anemometer will give time average values of the upward and downward vertical component of the wind, or with a simple modification, it will indicate and record the instantaneous values of the vertical components. The vertical anemometer provides a new basis for determining the fluxes of momentum, heat, and water vapor. The combination of the vertical anemometer, to provide necessary switching and chart advance signals, with a suitable sensor to measure the element under investigation allows the direct measurement of the flux of the element without the need for complicated formulas or theories. One series of vertical wind observations was subjected to power spectrum analysis. The observations confirm that at all observation sites so far investigated the mean value of the vertical motion is not zero; the points exhibit mean upward or downward motion, which must balance out over an area. (Author)

AD-256 360 Div. 2, 15, 30
(22 May 61) OTS price $10.50

Air Force Cambridge Research Labs., Bedford, Mass.
GUIDE FOR COMPUTATION OF HORIZONTAL GEODETIC SURVEYS,
by Harry R. Kahler and Normand A. Roy. Dec 60, 120p. incl. illus. tables. (Air Force surveys in Geophysics no. 128; Rept. no. AFCRL TN 60-659)
(In cooperation with Pan American World Airways)
Unclassified report

DESCRIPTORS: *Geodesics, Measurement, *Instrumentation, *Numerical methods and procedures, Mapping, Theodolites, Least squares method, Applied mathematics, Specifications, Standardization, Steel wire.

A collection of procedures, suggested formats, and descriptions of practices is presented as an aid in geodetic computing. The methods discussed for the most part have proven satisfactory where production work is carried out with desk calculators. This publication is intended as a working guide and is an explanation of methods, many of which are little known to nonspecialists. (Author)

AD-256 422 Div. 2, 8, 25
(22 May 61) OTS price $8.10

Electrical Engineering Research Lab., U. of Texas, Austin.
AN ANALYSIS OF THE MAGNETOTELLURIC METHOD FOR DETERMINING SUBSURFACE RESISTIVITIES,
by F. X. Bostick, Jr. and H. W. Smith. 28 Feb 61, 78p. incl. illus. (Rept. no. 120)
(Contract Nonr-37501)
Unclassified report

DESCRIPTORS: Earth, *Terrestrial magnetism, *Magnetic fields, *Electric fields, Electromagnetic waves, *Electromagnetic fields, *Resistance, Radiofrequency power, Radiofrequency spectrum analyzers, Propagation, Electrical properties, Mathematical analysis, Magnetic recording systems, Spectrographic analysis.

Theoretical and experimental features of the magnetotelluric method of determining the electrical resistivities of the earth's subsurface structures were investigated. Mathematical models consisting of multiple homogeneous and isotropic resistive layers in a semi-infinite half space were analyzed, and a set of normalized apparent resistivity curves were derived for a two-layer model. A theoretical treatment of the data analysis procedures is presented with particular emphasis on the power spectrum and cross spectrum analysis performed by the direct filtering method. It is pointed out that it is unnecessary and often undesirable to treat the data recordings as stationary time series. Many of the fluctuations in the resistivity estimates are the result of

the presence of two-dimensional inhomogeneities and anisotropies and may not be averaged out in the usual statistical sense. Recordings made of the fluctuations of the magnetotelluric fields were analyzed and the results of these analyses are presented. A brief description of the data recording and analysis equipment is also included. (Author)

AD-256 451 Div. 2, 12, 25, 30
(24 May 61) OTS price $18.50

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
RESEARCH IN SURVEYING, MAPPING, AND GEODESY. VOLUME I, PART I,
by D. L. Birx, R. S. Grubmeyer and others. Final rept. Oct 60, 278p. incl. illus. tables (Rept. no. F-A2217-1, vol. 1, pt. 1)
(Contract DA 44-009-eng-3767, Proj. no. 8T35-12-001-01)
Unclassified report

DESCRIPTORS: *Mapping, *Geodesics, Tensor analysis, Geometry, Errors, Tracking, Radiofrequency, Optical tracking, Refraction, Atmosphere, Light, Velocity, Relativity theory, Satellite vehicles, Propagation, Electromagnetic waves.

Contents:
Dyadic analysis
  Geometry of radar multilateration
  Strength of figure
Classical analysis
  Geometry
  Errors and strength of figure
Examination of RF systems
  Tracking accuracy of AN/FPS-16 radar, for satellites
  Minitrack
  Microlock
  Cotar-Moptar-Secor
  Azusa
An optical system for determination of satellite positions
Influence of atmospheric refraction on apparent direction of satellite
Concerning the velocity of light

AD-256 452 Div. 2, 12, 25, 30
(24 May 61) OTS price $8.10

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
RESEARCH IN SURVEYING, MAPPING, AND GEODESY. VOLUME I, PART II,
by D. L. Birx, R. W. Grubmeyer and others. Final rept. Oct 60, 80p. incl. tables (Rept. no. F-A2217-1, vol. 1, pt. 2)
(Contract DA 44-009-eng-3767, Proj. no. 8T35-12-001-01)
Unclassified report

DESCRIPTORS: *Mapping, *Geodesics, Tensor analysis, Geometry, Errors, Tracking, Radiofrequency, Optical tracking, Refraction, Atmosphere, Light, Velocity, Relativity theory, Satellite vehicles, Propagation.

Contents:
Introduction
  Statement and definition of problem
  The simultaneous situation
  The two basic problems differentiated
  Observation patterns considered
  Error propagation-functional treatment
  Error propagation, dyadic treatment
Instrumentation and related problems
  Radio tracking systems for geodetic applications
  Optical instruments
  Star catalogues
  Refraction
  Timing
  Velocity of light
General conclusions
Extra-terrestrial phenomena
  Application of Doppler determination of earth's tangential velocity to the determination of the shape of the earth
  Inverse interferometry for distance measurement on the earth
Non-simultaneous situation

AD-256 525 Div. 2, 25
(24 May 61) OTS price $1.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
SPECTROSCOPIC ANALYSIS OF FLUORINE USING CaF BAND SPECTRUM. (THIRD REPORT) REPORT ON THE FLUORINE CONTENT OF PRECIPITATES AND SOIL OF TAMAGAWA HOT SPRING, AKITA PREFECTURE,
by Keiichiro Fuha. May 61, 10p. incl. illus.
(Technical note no. FRL TN 70; Trans. of Nippon Kagaku Zasshi 75:1957-1959, 1954)
(In cooperation with Tokyo U.)
Unclassified report

DESCRIPTORS: *Hydrology, Soils, *Fluorine, *Calcium compounds, *Fluorides, Geology, *Spectographic analysis, Sedimentation, Japan.

Applying a semiquantitative spectroscopic analysis utilizing the CaF band spectrum to samples collected from Tamagawa Hot Spring, the author investigated the fluorine content of the hot spring precipitates, soil from the downstream river bed and rocks in the vicinity, to determine the variability of the fluorine contained in the hot spring water. (Author)

AD-256 605 Div. 2
(26 May 61) OTS price $1.10

Air Weather Service, Scott Air Force Base, Ill.
THE PREDICTION OF AFTERNOON VISIBILITY IN WINTER AT RAF BRIZE NORTON,
by Richard F. Cummings. Nov 60, 7p. incl. tables.
Unclassified report

DESCRIPTORS: *Weather forecasting, *Visibility, Great Britain, Air force operations, Meteorology, Fog, Humidity, Temperature, Surfaces, Pressure.

A method was developed for the prediction of afternoon visibility from information available on the midnight soundings of Liverpool, Crawley, Camborne and Hemsby and the value of the 0600Z visibility. The following parameter was important in predicting fog: persistence, 850 MB height gradient, surface temperature, and relative humidity. The method was successful for the period 15 November-28 February. Busts were due largely to visibility dropping rapidly after 0600Z either in pre-frontal fog or moderate snow fall both of which are obstructions to visibility unapproachable by this method. Low incidence of persistent fog during 1-15 Nov and beyond February suggested that including these periods in the study would only complicate the diagrams. The pollution sources of London, Birmingham, Coventry and Nottingham are included indirectly in the 850 MB diagram. It was found that when the surface wind was from these general directions the excess of smoke in the atmosphere would support an occurrence of heavy fog with a much stronger 850 MB height gradient than if the smoke were not so prevalent. (Author)

AD-256 606 Div. 2
(26 May 61) OTS price $1.60

Air Weather Service, Scott Air Force Base, Ill.
AN OBJECTIVE AID FOR FORECASTING STRONG AND GUSTY SURFACE WINDS AT TRAVIS AFB, CALIFORNIA,
by Thomas H. Simmonds. May 61, 9p. incl. tables.
Unclassified report

DESCRIPTORS: *Weather forecasting, Wind, *Gusts, Meteorological data, California, Meteorology.

Work concerned the forecasting of strong southwesterly surface winds with accompanying gusts of 25 knots or greater during the months of March through October. Due to the seasonal variations in the weather regimes, it was found necessary to divide the data into two seasons—March through June and July through October. (Author)

AD-256 666 Div. 2, 12, 15
(26 May 61) OTS price $8.10

Rand Corp., Santa Monica, Calif.
EQUATIONS OF PERTURBED MOTION FOR A SATELLITE IN A NEARLY CIRCULAR, NEARLY EQUATORIAL ORBIT.
by F. T. Smith. 27 Feb 61. 73p. (Research memo. RM-2716)
(Contract AF 49(638)700)
Unclassified report

DESCRIPTORS: Satellite vehicles, *Orbital flight paths, *Satellite vehicle trajectories, Differential equations, Perturbation theory, Space flight, Space navigation, *Celestial mechanics.

A set of differential equations is derived which defines the perturbed motion of a celestial body in terms of a particular set of orbital parameters. This set of orbital parameters is well suited to orbits that are circular or nearly so, since no singularities occur in the equations when the orbital eccentricity vanishes. In addition, this set of orbital parameters may be used to define orbits of small or zero inclination. The set of equations is given in the forms for both elliptic and circular orbits, with the perturbing acceleration expressed in terms of rectangular coordinates and derivatives of a disturbing function. Applications of the equations to the calculation of general perturbations, special perturbations, and orbit transfers are suggested. (Author)

AD-256 867 Div. 2, 6
(31 May 61) OTS price $5.60

Texas A. and M. Research Foundation, College Station.
SOME EFFECTS OF RANGE UPON AN/CPS-9 RADAR REFLECTIVITIES IN THUNDERSTORMS,
by Tom E. Sanford. Jan 61, 42p. incl. illus. tables (Scientific rept. no. 3)
(Contract AF 19(604)6136, Proj. no. 237)
(AFCRL-226)
Unclassified report

DESCRIPTORS: Meteorology, *Meteorological radar, Radar echo areas, *Radar signals, Thunderclouds, *Storms, *Attenuation, Reflection, Radar reflections, Range.

Echo height and radar reflectivity measurements were obtained for central and southeast Texas thunderstorms. Storms were classified into five categories according to the severity of surface weather reported by cooperative observers, U. S. Weather Bureau severe storm summaries, and newspaper clippings. Median profiles of the reflectivities were constructed, and comparisons were made between reflectivities measured at various ranges. Regression curves were obtained which relate the product of the attenuation and beam filling factors to the target distance from the radar. Results indicate that attenuation of 3.2-cm radiation and beam filling are important factors in the radar equation and cannot be ignored even at close range when accurate measurements are required. The signal depletion term appears more important than the beam filling factor in power attenuation resulting from increased range. (Author)

AD-256 899 Div. 2, 25
(2 June 61) OTS price $7.60

Allied Research Associates, Inc., Boston, Mass.
METEOROLOGICAL SATELLITE SYSTEM ANALYSES,
by Gerald Cooper. Semi-annual Technical summary rept. no. 1, 24 Dec 59. 68p. incl. illus. tables.
(Contract AF 19(604)5582)
(ARPA Order no. 26-59)
Unclassified report

DESCRIPTORS: *Satellite vehicles, Ozone, *Meteorological instruments, Meteorology, Infrared detectors, Infrared radiation, *Aerial photography, Ultraviolet radiation, Instrumentation.

A literature survey of meteorological satellite applications was made to define some information requirements of meteorological consumers. An attempt was made to appreciate problems involved in transmitting such information to the consumer by examining photographs of the earth taken from an Atlas nose cone. Difficulties in processing the photographs led to the development of a technique for establishing the camera axis azimuth and time of photograph from landmarks when other data cannot supply this information. Some study was devoted to determining the type of meteorological information than can be developed by using sensors which detect ultraviolet and infrared radiation rather than the visible radiation detected in photographs. In this connection, a method for determining atmospheric ozone amounts by measuring the scattered radiation at two different wave lengths in the ultraviolet was investigated to determine the theoretical ratios of radiation intensities to be expected. The view of the earth's atmosphere in an infrared water absorption band was examined and found to correspond to a picture of the temperature of a constant dew point surface. Some constant dewpoint surfaces were analyzed in connection with the corresponding conventional surface and upper air weather maps. Meteorological relationships exist which should be studied further. (Author)

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-256 322 Div. 3, 16
(19 May 61) OTS price $1.10

Armour Research Foundation, Chicago, Ill.
QUALITY ASSURANCE TEST OF BG LOT NO. 696, 697, 60-2, AND 60-19,
by Sol Miller. 1960. 7p. incl. tables.
(Contract DA 18-064-404-cml-353; continuation of Contract DA 18-064-cml-2747)
Unclassified report

DESCRIPTORS: *Aerosols, *Bacterial aerosols, Bacteria, Aerosol generators, Scattering, Life expectancy, Tests, Test methods, Standardization.

The objective of this test was to compare the aerosol parameters of four lots of BG with those of a reference BG lot. The results of the test indicate that the differences between the lots are not statistically significant. (Author)

AD-256 324 Div. 3
(19 May 61) OTS price $1.10

Armour Research Foundation, Chicago, Ill.
QUALITY ASSURANCE TESTING. SM LOTS 320, 332, AND 333,
by Sol Miller. 1960, 7p. incl. tables.
(Contract DA 18-064-404-cml-353)
Unclassified report

DESCRIPTORS: *Bacterial aerosols, Quality control, Statistical analysis, Statistical tests, Tests.

Tests were conducted to determine the acceptability of SM lots 320, 332, and 333 by comparison of their aerosol parameters with those of a pooled SM reference slurry. (Author)

AD-256 325 Div. 3, 16
(19 May 61) OTS price $1.10

Armour Research Foundation, Chicago, Ill.
QUALITY ASSURANCE TEST OF BG LOT NO. 698, 699, 703, 60-51, AND 60-54,
by Sol Miller. 1960, 7p. incl. tables.
(Contract DA 18-064-404-cml-353)
Unclassified report

DESCRIPTORS: Aerosols, *Bacterial aerosols, *Bacteria, Standardization, Test methods, Life expectancy, Quality control, Tests.

The objective of this test was to compare the aerosol parameters of five lots of BG with those of a reference BG lot. The results of the test indicate that the differences between the lots are not statistically significant. The mean values for the decay rate and source strength for each lot are tabulated. (Author)

AD-256 326 Div. 3, 16
(19 May 61) OTS price $1.10

Armour Research Foundation, Chicago, Ill.
AEROSOL STUDIES WITH BACTERIOPHAGE. EXPLANATORY STUDIES,
by Sol Miller. Rept. for 25 Jan-8 Feb 60. 8 Feb 60. 10p. incl. illus. tables.
(Contract DA 18-064-404-cml-353, continuation of Contract DA 18-064-cml-2747)
Unclassified report

DESCRIPTORS: *Aerosols, *Bacterial aerosols, Bacteria, Culture media, *Escherichia, Preparation, Scattering, Aerosol generators, Life expectancy, Test methods, Tests.

An aerated liquid culture method was found satisfactory for growing coliphage cultures which gave plaque counts of 1.0 x 10 to the 10th power per ml. A soft agar layer method for enumeration of coliphage was found to give reproducible plaque counts. The mean percent recovery at 2, 16, and 30 minutes after dissemination of aerosols of coliphage from the Hartman fixture at ambient temperature and 85% relative humidity was 54.6%, 36.9%, and 27.7%, respectively. The decay rate was 2.4% per minute and the source strength was 55%. The aerosol properties are satisfactory for using coliphage as a tracer, or as a viral simulant in disseminator studies and for studies with a suitable stabilizer treatment. (Author)

AD-256 897 Div. 3, 4
(2 June 61) OTS price $2.60

Chemicals and Plastics Div., Food Machinery and Chemical Corp., Baltimore, Md.
SYNTHESIS OF COMPOUNDS FOR USE IN CHEMICAL WARFARE RESEARCH,
by G. Sumrell. Bimonthly rept. no. 13, March-April 61. 10 May 61, 1v. incl. tables.
(Contracts DA 18-108-405-cml-296 and DA 18-108-cml-6572, Proj. 4-08-03-016-07)
Unclassified report

This rept. includes Synthesis repts. no. 109-114.

DESCRIPTORS: *Chemical warfare agents, Hydroxides, Aldehydes, Benzaldehydes, Amines, Methyl radicals, Piperidines, Phenanthrenes, Azoles, Chlorides, Cyclohexanones, Nitro radicals, Pyridines, Ethanols, Synthesis, Chemotherapeutic agents, Phenyl radicals, Ethyl radicals.

A method is reported for the synthesis of each of the following compounds: 2-dimethylaminobenzaldehyde, 3-dimethylaminobenzaldehyde, 1-(2',2'-diphenyl-2'-hydroxyethyl)-4-methylpiperazine dihydrochloride, 3-beta-hydroxyethyl-4-methyl-5-phenyloxazolidine hydrochloride, 2-hydroxymethyl-1-cyclohexanone, 4-nitro-7,8,9,10-tetrahydrophenanthridine, 2-(4'phenylpiperidino)-ethanol, and 1-(4'-pyridyl)-2-nitro-2-phenylethanol. (Author)

4. CHEMISTRY

AD-256 096 Div. 4
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SCIENTIFIC REPORTS OF HIGHER SCHOOLS. CHEMISTRY

AND CHEMICAL TECHNOLOGY (SELECTED ARTICLES).
8 Nov 60. 19p. incl. illus. table, 16 refs. (Trans. no. MCL-249 from Nauchnyye Doklady Vysshey Shkoly. Khimiya i Khimicheskaya Tekhnologiya 1:80-83, 84-87, 1959)

Unclassified report

DESCRIPTORS: *Cerium, *Lanthanum, *Neodymium, *Scandium, *Thorium, *Ytterbium, *Uranium, Salicylic acids, Esters, *Complex compounds, Radioactive isotopes, Metal-organic compounds, *Separation, *Solvent extraction, *Ion exchange, Ion exchange resins, *Rare earth elements, Chromatographic analysis, Acetic acids, USSR. *Salicylates, *Yttrium.

THE EXTRACTION OF SALICYLATES OF Sc, Y, Ce La, U AND Th: The distribution of salicylates of Sc, Y, Ce, La, U, and Th between isoamyl alcohol and aqueous solutions depends on the pH of the medium. Salicylates of Sc, Y, Ce, La, Th and U are quantitatively extracted by isoamyl alcohol at a pH of 3.3 to 5.5 for Sc, greater than 4 for Y, greater than 4.5 for La, greater than 5.0 for Ce, greater than 3.0 for Th, and between 2.5 to 5.5 for U. THE FORMATION OF COMPLEX COMPOUNDS OF Nd AND Y WITH ETHYLENEDIAMINATETRAACETIC ACID WITH CATION-EXCHANGING CHROMATOGRAPHY: The mechanism of the formation of complex compounds of Nd and Y with ethylenediaminetetraacetic acid during cation exchange chromatography was investigated. During elution of Nd by a solution of salts of H4Y there occurs an absorption of H4Y by the resin, apparently in the form of a complex compound Nd (NdY)3. A noticeable absorption of H4Y does not occur during elution of Y. The difference in the ability of the complex compounds Nd(3+) and Y(3+) with H4Y to be absorbed by the resin can further the division of the rare earths.

AD-256 098 Div. 4, 25
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE INVESTIGATION OF STRUCTURAL PROPERTIES AND CHEMICAL TRANSFORMATIONS OF CARBAZOLE AND SOME OF ITS DERIVATIVES (Issledovaniye Osobennostey Stroeniya I Khimicheskikh Prevrashche Karbazola I Nekotorykh Ego Proizvodiyka), by S. I. Omel'chenko and Z. V. Pushkareva.
8 Nov 60, 9p. incl. illus. (Trans. no. MCL-254 from Zhurnal Obshchey Khimii 28:2706-2710, 1958)

Unclassified report

DESCRIPTORS: *Carbazoles, Amines, Glycines, Molecular structure, Chemical reactions, Alkyl radicals, Acylation, Methyl radicals, Ultraviolet spectrophotometers, Absorption, Heterocyclic compounds, Benzoyl radicals, Polycyclic compounds, Ultraviolet spectroscopy, USSR.

The reactions of alkylation, acylation, benzoylation and carboxy-methylization performed on 3-aminocarbazole showed that there was a significant difference between the amino group of 3-aminocarbazole and the amino group of the ordinary arometic amines. 3-Aminocarbazole, 3,6-diaminocarbazole and especially 3-carbazyl glycine were observed to possess the tendency of transforming into the corresponding quinodiimines by oxidation. The comparison of the spectral curves in the ultra-violet region of the 3-aminocarbazole products showed that its chemical singularity is dependent on the interaction within the amino groups of the electronic systems of hetero-atoms and nitrogens. (Author)

AD-256 128 Div. 4, 7, 26
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CHEMIST (SELECTED ARTICLES)
3 Nov 60, 11p. (Trans. no. MCL-596 from Chemik 2:60-62, Feb 58)

Unclassified report

DESCRIPTORS: *Sodium, Sodium compounds, Carbonates, Production, Low pressure research, Pressure, High temperature research, Vacuum furnaces, Vacuum apparatus, *Fuel cells, Hydrogen, Oxygen, *Gases, Electrolytic cells, Liquefied gases, Argon, Nitrogen, *Industrial production, USSR, Manufacturing methods, Dissociation.

CONTENTS:
Manufacture of Metallic Sodium Under Reduced Pressure, by Tadeusz Szarowicz
New Developments in the Electric Cell Field, by Jerzy Dambski
Development of the Production of Industrial Gases in America, by S. N.

AD-256 135 Div. 4, 17
(18 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
TRANSACTIONS OF THE FOURTH CONFERENCE ON ELECTROCHEMISTRY (SELECTED ARTICLES).
4 Nov 60, 25p. incl. illus. 27 refs. (Trans. no. MCL-614 from Trudy Chetvertogo Soveschaniya Po Elektrokhimii, pp. 358-361; 493-497; 520-523, 1959)

Unclassified report

DESCRIPTORS: *Electrochemistry, Melting, *Electrolytes, *Manganese, *Chromium, *Electrodeposition, Cathodes, Metals, *Polarographic analysis, *Conferences, Electrolytic cells, Production, USSR, Powder metallurgy, Polarization, Electrolysis.

Contents:
Certain Problems in the Polarography of Molten Electrolytes, by N. G. Chovnyk
Obtaining Manganese and Chromium by Hydrometallurgical Means, by R. J. Agladze
Cathodic Deposition of Metal in Dispersed Form, by B. V. Drozdov

AD-256 150 Div. 4
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
A STUDY OF EQUILIBRIUM IN THE REDUCTION OF BERYLLIUM OXIDE WITH CARBON AT HIGH TEMPERATURES, by F. Sh. Muratov and A. V. Novoselova. 7 Nov 60. 6p. incl. table, 11 refs. (Trans. no. MCL-672 from Doklady Akademii Nauk SSSR 129:334-336, 1959)

Unclassified report

DESCRIPTORS: *Beryllium compounds, *Oxides, Carbon, *Reduction, High temperature research, Chemical equilibrium, Chemical reactions, USSR.

The equilibrium in a beryllium oxide-carbon system is studied by the manometric method in the range 1400-2000 C. Equilibrium pressure can be reached only in the temperature range 1700-1950 K. The reduction products at these temperatures contained beryllium carbide and unreacted beryllium oxide and carbon. At higher temperatures the pressure of the carbon monoxide at first reaches a maximum, and then begins to decrease sharply, never reaching a definite value. The dependence of the change in free energy on temperature was of a linear nature. The conclusion is made that in the 1700-1950 K interval an equilibrium state exists corresponding to the reaction whereby 1/2 Be2C (solid) and CO (gas) are the products. (Author)

AD-256 193 Div. 4
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
METHODS FOR THE PREPARATION OF DIBORANE,
4 Nov 60, 9p. (Trans. no. MCL-741 from German Patent no. 1076103, p. 3, 23 Feb 60)
Unclassified report

DESCRIPTORS: *Diboranes, Preparation, Synthesis, *Boron compounds, Hydrides, Oxides, Borates, Reduction, Carbides, Chemical reactions, Patents, Germany.

AD-256 265 Div. 4
(19 May 61) OTS price $2.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
THE PEROXIDATION OF POLYSTYRENE AND POLY-P-ISOPROPYL-STYRENE,
by W. Hahn and H. Lechtenbohmer. May 61, 25p. incl. illus. tables (Technical notes FRL-TN-29; Trans. from Die Makromolekular Chemie 16:50-64, 1955)
Unclassified report

DESCRIPTORS: *Styrenes, *Polymers, Cumenes, *Polymerization, Oxidation, *Peroxides, Synthesis, Chemical reactions, Propyl radicals, Acrylic resins, Methyl radicals, Benzenes, Ethylenes, Dioxides, Heterocyclic compounds, Organic solvents, Catalysis.

Experiments were carried out as an attempt to peroxidize polystyrene and poly-p-isopropyl styrene. The reaction proceeds with difficulty in the case of polystyrene, producing only a small yield. In the case of poly-p-isopropyl styrene, however, peroxidation proceeded as easily as with cumene. The products obtained were investigated as initiators in the polymerization of methyl methacrylate. (Author)

AD-256 275 Div. 4, 15, 25
(15 May 61) OTS price $3.60

Michigan U., Coll. of Engineering, Ann Arbor.
THE THEORY OF LINEAR GRAPHS WITH APPLICATIONS TO THE THEORY OF THE VIRIAL DEVELOPMENT OF THE PROPERTIES OF GASES,
by G. W. Ford and G. E. Uhlenbeck. 1961, 132p. incl. illus. tables.
(Contract Nonr-122415, Proj. NR 013-301)
Unclassified report

DESCRIPTORS: Molecules, Energy, Pressure, Mathematics, *Combinatorial analysis, *Gases, *Statistical analysis, Mathematical analysis, Physical chemistry.

Contents:
Introduction to the theory of graphs
Expansion of the properites of a gas in powers of the fugacity
The virial expansion of the properties of a gas
The counting problem for free graphs
Remarks on the integral problem; the Gaussian model
Appendix 1. Proof of the Polya theorem
Appendix 2. Tables of the number of graphs with p points and k lines up to p equals 7
Appendix 3. Tables of graphs and graph groups with up to six points
Appendix 4. Tables of $n(p,k,d)$

AD-256 280 Div. 4, 25
(19 May 61) OTS price $1.60

Rensselaer Polytechnic Inst., Troy, N. Y.
MOLTEN CARBONATE ELECTROLYTES: PHYSICAL PROPERTIES, STRUCTURE, AND MECHANISM OF ELECTRICAL CONDUCTANCE,
by George J. Janz and Max R. Lorenz. Mar 61, 1v. incl. illus. tables, 36 refs. (Technical rept. no. 12)
(Contract Nonr-59110)
Unclassified report

DESCRIPTORS: *Alkali metal compounds, Salts, Lithium compounds, Sodium compounds, Potassium compounds, *Carbonates, Liquids, *Electrolytes, High temperature research, Surface tension, Density, Conductivity, Electrical properties, Melting, Physical properties, Ionization, Thermodynamics, Mixtures, Electrical conductance, Electrochemistry.

Results are presented of an investigation of the properties of surface tension, density, and electrical conductance for molten Li2CO3, Na2CO3, and K2CO3 and some mixtures in the temperature range of 750 to 1000 C. The surface tensions are approximately twice the values for the corresponding chlorides: the densities and electrical conductance are quite comparable to those of the chlorides. The ionic nature of the molten carbonates is examined from the physicochemical criteria based on these properties: and the mechanism of electrical transport is considered in the light of current theoretical concepts. Relative to Na2CO3 - K2CO3 mixtures, the surface tensions and partial molal volumes indicate but little deviations from the predictions for thermodynamically ideal mixtures. (Author)

AD-256 286 Div. 4, 14
(19 May 61) OTS price $1.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
CARBON CHAIN POLYMERS AND COPOLYMERS. X. BLOCK POLYMERIZATION OF METHYLMETHACRYLATE IN THE PRESENCE OF TRIBUTYLBORON,
by G. S. Kolesnikov and N. V. Klimentova. May 61, 12p. incl. tables (Technical notes no. FRL TN 48; Trans. from Vysokomolekulyarnyye Soyedineniya 1:362-6, 1959)
Unclassified report

DESCRIPTORS: *Polymers, *Polymerization, *Acrylic resins, Methyl radicals, Butyl radicals, Boron compounds, Catalysts, Dilatometers, Temperature, Reaction kinetics, Viscosity, Polymer solutions, Molecular weight, USSR.

The kinetics of block polymerization of methylmethacrylate in the presence of tributylboron was studied, and the effect of temperature and catalyst concentration on the polymerization rate and on the molecular weight of polymethylmethacrylate elucidated. (Author)

AD-256 351 Div. 4, 25, 30
(23 May 61) OTS price $2.60

Pennsylvania State U. Coll. of Mineral Industries, University Park.
INFLUENCE OF DISPLACIVE-SHEARING STRESSES ON THE KINETICS OF RECONSTRUCTIVE TRANSFORMATIONS EFFECTED BY PRESSURE IN THE RANGE 0-100,000 BARS, by Frank Dachille and Rustum Roy. 2 Apr 60, 1v. incl. illus. 12 refs. (Technical rept. no. 1; Contribution no. 59-90)
(Contract Nónr-65620)
Unclassified report

DESCRIPTORS: Shear stresses, *Transformations, *Phase studies, Temperature, Chemical bonds, *Chemical milling, Chemical engineering, Reaction kinetics, *Phase transitions, Pressure.

Earlier results showed that ordinary laboratory grinders and mixers were able to convert several phases (e.g. PbO_2, MnF_2, $CaCO_3$, BeF_2, etc.) into their respective high-pressure forms which, at equilibrium require 10-15,000 atmospheres at room temperature. Hence, experiments were devised to attempt to separate the effect of hydrostatic pressure from those of shearing stresses and bond-breakage. A study of the influence of shearing stresses superimposed upon quasi-hydrostatic pressures of up to 100,000 bars at temperatures below 550 C was made possible by the development of simple apparatus. This consists of the Bridgman uniaxial-type apparatus, with a provision for continuous rotation of the bottom piston very slowly back and forth through a 2 degree arc. The sample is heated externally; displacive-shearing runs with pressure and temperature automatically controlled can be made for periods exceeding several days if desired. The results clearly separate the influence of hydrostatic pressure itself upon reaction rates from the effect of the added displacive-shearing stresses. From the results it becomes clear that equilibrium relations between phases are not altered by the shearing stresses. (Author)

AD-256 365 Div. 4, 7, 25
(22 May 61) OTS price $2.60

Louisiana State U., Baton Rouge.
RECTIFICATION BY THE ELECTRICAL DOUBLE LAYER AND ADSORPTION KINETICS,
by Mitsugi Senda and Paul Delahay. Mar 61, 20p. incl. illus. 20 refs. (Technical rept. no. 44)
(Contract Nonr-30000, Proj. NR 051-258)
Unclassified report

DESCRIPTORS: *Adsorption, Reaction kinetics, *Electrodes, *Electrical double layer, Ions, Electrochemistry, Theory, Electric potential, Impedance, Diffusion, Frequency, Rectifiers, Mathematical analysis.

Qualitative and quantitative treatments are given of non-faradaic rectification by the electrical double layer for specific adsorption of a neutral substance or an ionic species in presence of a large excess of supporting electrolyte. Control of the mean charge (q) and/or mean potential (E) is considered. Rectification at constant q results in a shift of E for an ideal polarized electrode and vice-versa. It is best to maintain E constant and to supply the rectification charge by means of a double pulse method. A theory of this method is developed without assumption about the explicit form of the rate equation for adsorption kinetics. The charge variation due to rectification is expressed in terms of the elements of the equivalent circuit for the non-faradaic impedance and the latter are given as functions of thermodynamic and kinetic parameters for adsorption. The influence of frequency is analyzed; the general equation can be applied directly to the analysis of experimental results. Particular types of adsorption kinetics are also discussed. The method is applicable to frequencies greater than 1 mc at which non-faradaic impedance measurements with a bridge are hardly feasible. (Author)

AD-256 366 Div. 4, 7, 25
(22 May 61) OTS price $2.60

Louisiana State U., Baton Rouge.
ELECTRODE PROCESSES WITH SPECIFIC OR NON-SPECIFIC ADSORPTION: FARADAIC IMPEDANCE AND RECTIFICATION, by Mitsugi Senda and Paul Delahay. Mar 61, 1v. incl. illus. 27 refs. (Technical rept. no. 45)
(Contract Nonr-30000, Proj. NR 051-258)
Unclassified report

DESCRIPTORS: *Adsorption, *Electrodes, *Impedance, Rectifiers, Reaction kinetics, Electrical double layer, Electric potential, Electrochemistry, Mathematical analysis.

Faradaic impedance and faradaic rectification are discussed for processes with specific or non-specific adsorption of reactants and/or reaction products. No explicit form of the rate equation for adsorption kinetics is postulated. Analysis of the faradaic impedance for processes with specific adsorption includes: derivation of a general current - potential characteristic for small amplitudes without the postulating of an explicit form for the rate equation for charge transfer kinetics; an equivalent circuit for electrode processes in which adsorption processes are independent of one another (e.g., as for metal deposition with amalgam formation); variations of the phase angle with frequency and analysis of some existing data in the literature; and correction for the double layer capacity. Equivalent circuits for processes with non-specific adsorption of reactants, i.e., with repulsion or attraction of the discharged species, are also derived for the faradaic impedance. Faradaic rectification is treated for the above cases, and the frequency dependence of the rectification voltage is analyzed in detail. Implications in the determination of kinetic parameters are pointed out. (Author)

AD-256 367 Div. 4, 7, 25
(22 May 61) OTS price $1.10

Louisiana State U., Baton Rouge.
(No title) Final rept. 1 Apr 51-31 May 61,
by Paul Delahay. 31 May 61, 4p. 45 refs. (Technical rept. no. 46)
(Contract Nonr-30000, Proj. NR 051-258)
Unclassified report

DESCRIPTORS: *Bibliography, Electrolysis, *Electrochemistry, Reaction kinetics, Polarographic analysis, Recombination reactions, Electrodes, Adsorption, Electrical double layer, Impedance, Rectifiers.

A bibliography is presented of technical reports and publications in electrochemistry research for the period of the contract (April 1, 1951 to May 31, 1961) by Louisiana State University. The 45 references are arranged by date of publication.

AD-256 389 Div. 4, 14, 25
(19 May 61) OTS price $1.60

Ohio State U. Research Foundation, Columbus.
RESEARCH ON PHASE EQUILIBRIA BETWEEN BORON OXIDES AND REFRACTORY OXIDES, INCLUDING SILICON AND ALUMINUM OXIDES,
by P. J. Gielisse, T. J. Rockett, and W. R. Foster. Quarterly progress rept. no. 7, 1 Jan-31 Mar 61. 5 Apr 61, 14p. incl. illus. tables. (Rept. no. 931-7)
(Contract AF 33(616)6509, Proj. 7021)
Unclassified report

DESCRIPTORS: *Boron compounds, *Silicon compounds, *Aluminum compounds, *Oxides, Refactory materials, *Phase studies, Phase transitions, Temperature, Crystals, Crystal structure, X-ray diffraction analysis, Glass, Liquids, Solids.

Effort was directed toward the completion of the phase diagram for the system SiO2-B2O3 and clarification of related problems. The most noticeable change in the diagram is the extension of the postulated two-liquid area towards the B2O3 side. X-ray studies of the Si-B-O system were made and 3 possible isothermal diagrams for the system are presented. In the system Al2O3-B2O3 final runs were made in the high B2O3 portion of the diagram. The relation of 2 of the 3 compounds in this system were established. Preliminary work is continuing on the ternary system Al2O3-B2O3-SiO2.

AD-256 404 Div. 4, 25
(22 May 61) OTS price $1.10

Purdue U., Lafayette, Ind.
THE HEAT OF FORMATION OF THE HYPOBROMITE ION,
by J. W. McDonald and J. W. Cobble. 1 May 61, 7p. incl. tables, 14 refs.
(Contract AF 18(600)1525)
(AFOSR-577) Unclassified report

DESCRIPTORS: *Bromide compounds, Oxides, *Complex ions, Hydrogen compounds, Acids, *Ionization, Ions, *Bromine, *Hydrolysis, Hydroxides, Sodium compounds, Solutions, Solvent action, Disproportionation, Heat of formation, Entropy, Thermodynamics, Thermochemistry.

The heat of formation of the hypobromite ion has been determined by measurement of the heat of hydrolysis of bromine in alkaline solutions at 25 C. The value so obtained was -23.05 + or - 0.2 kcal/mole. With a free energy of -8.2 kcal/mole, the partial molal entropy has been determined to be 8.5 + or - 0.7 gbs./mole at 25 C. (Author)

AD-256 405 Div. 4
(19 May 61) OTS price $3.60

Chicago U., Ill.
REACTIONS OF DIAZOOXIDES,
by Michael J. S. Dewar, Roy Dietz, and K. Narayanaswami. 1960. 35p. 45 refs. (Technical rept. no. 1)
(Contract Nonr-212121)
Unclassified report

DESCRIPTORS: *Azo radicals, *Oxides, *Chemical reactions, Organic compounds, *Benzenes, Bromides, Decomposition, Synthesis, Substitution reactions.

Research is being conducted on the following projects: (1) survey of the reactions of 3,5-dibromobenzene-1,4-diazooxide (I); (2) study of further substituted diazooxides; (3) the in situ preparation and decomposition of diazooxides; and (4) a search for other aromatic diazo-compounds whose decomposition may proceed similarly. An analysis is being made of the orientation of attack in 2'- and 4'-chloro-3,5-dibromo-4-hydroxybiphenyl. Attempts were made to synthesize diazooxides in which first one and then both of the Br atoms in (I) were replaced by phenyl. Efforts were unsuccessful in the preparation of a diazo-compound which was sufficiently stable to be isolated in good yield from the corresponding diazonium salt and yet sufficiently unstable to decompose thermally in appropriate solvents at moderate temperatures. In project 4, a search is being made for acidic groups to occupy the position para to the diazonium function.

AD-256 407 Div. 4
(19 May 61) OTS price $1.60

Rochester U., N. Y.
AROMATIC CHARACTER IN POLYCYCLIC MOLECULES,
by V. Boekelheide. Final rept. 2 Feb 59-1 Feb 61. 1 Feb 61, 12p. incl. illus. 12 refs.
(Contract DA 30-069-ORD-2528(2290))
(OOR rept. no. 2290:4) Unclassified report

DESCRIPTORS: *Polycyclic compounds, Amines, Heterocyclic compounds, *Pyridines, Complex ions, Nitrogen compounds, Substitution reactions, Synthesis, Chemical reactions, Molecular structure, Molecular spectroscopy, Nuclear magnetic resonance, Carboxylic acids, Esters, Protons, Theory, Monocyclic compounds, Ultraviolet spectroscopy, Pyrroles.

A new method for the synthesis of five-membered rings has been discovered which appears to have very broad generality. It has provided a convenient synthetic route for cycl(3.2.2)azine. Further experimental studies on the properties of this molecule are in good accord with the predictions of molecular orbital theory. Attempts to prepare examples of other cyclazines have led to new compounds and some interesting experimental work but, in each case, the over-all synthetic scheme has failed at a crucial stage. (Author)

Division 4 - CHEMISTRY

AD-256 420 Div. 4
(22 May 61) OTS price $1.60

St. Louis U., Mo.
SYNTHESIS AND REACTIONS OF CYCLIC BORON-NITROGEN COMPOUNDS,
by Leo F. Hohnstedt and Angelo M. Pellicciotto. Final rept. 19 Apr 61. 18p.
(Contract Nonr-279300, Proj. no. NR 052-413)
Unclassified report

DESCRIPTORS: *Boron compounds, *Nitrogen compounds, Synthesis, Chemical reactions, Chlorides, Phenyl radicals, *Amines, Monocyclic compounds, Ethyleneamines, Polycyclic compounds, *Borines.

The reaction of BCl3 and o-phenylenediamine dihydrochloride was studied in detail. A convenient synthesis was developed for the preparation of 2-chloro-1,3,2-benzodiazaboroline, which proved to be a useful intermediate in the preparation of 1,3,2-benzodiazaboroline and its B-substituted derivatives. The reactions of BCl3 with ethylenediamine dihydrochloride are being studied. Samples of B-trichloroborazole (I) in benzene maintained for prolonged periods at 80 C appeared to undergo slight reaction. Compound I reacted vigorously with triethylamine. Apparently extensive reaction occurs when I is treated with ethyleneimine, phthalimide, or potassium phthalimide in benzene.

AD-256 613 Div. 4
(26 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SYNTHESIS AND PROPERTIES OF DIMETHYL SUBSTITUTE ALKANES OF THE C12-C16 COMPOSITION,
(Sintez i Svoystva Dimetilzameshchennykh Abkanov Sostava C12-C16),
by Al. A. Petrov, S. R. Sergiyenko and others. 2 Dec 60, 6p. incl tables (Trans. no MCL-453 from Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, pp. 1421-1424, 1959)
Unclassified report

DESCRIPTORS: *Hydrocarbons, Methyl radicals, Physical properties, Crystallization, Molecular structure, Molecular weight, Low temperature research, Glass, Synthesis, USSR, *Methanes, Viscosity.

The synthesis and porperties of nine dimethyl-substituted alkanes of the C12-C16 composition are discussed. Ideas have been expressed regarding the causes of vitrification of paraffinic hydrocarbons and about the relationship between this phenomenon and the structure and molecular weight of the latter. (Author)

AD-256 617 Div. 4, 14
(26 May 61) OTS price $6.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
JOURNAL OF INORGANIC CHEMISTRY (SELECTED ARTICLES).
1 Dec 60, 1v. incl. illus. tables (Trans. no MCL-755 from Zhurnal Neorganicheskoy Khimii 5:1241-1247, 1257-1266, 1267-1282, June 60)
Unclassified report

DESCRIPTORS: *Inorganic substances, *USSR, *Electrochemistry, Titanium compounds, Carbides, Chlorides, *Complex compounds, Lithium compounds, Sodium compounds, Sulfates, Potassium compounds, Chemical reactions, Thermochemistry, Thermodynamics, Barium compounds, Carbonates, Dioxides, Zirconium compounds, Heating, Phase studies.

Contents:
Electrochemical behavior of titanium carbide in a chloride fusion, by M. V. Smirnov and Yu. N. Krasnov
On difficult complex formation in a tetra mutual system of lithium, sodium and potassium chlorides and sulfates, by Ye. K. Akopov and A. G. Bergman
Reaction of Ba CO3 with TiO2 and ZrO2 upon heating, by N. B. Karpenko and E. K. Keler

AD-256 623 Div. 4, 3
(26 May 61) OTS price $9.60

Monomer-Polymer Labs., Borden Co., Philadelphia, Pa.
BASIC RESEARCH ON POLYMERIC MATERIALS FOR CHEMICAL CORPS USE,
by K. C. Tsou, A. Malatesta and E. Hoess. Final rept. 1 Jan 59-31 Mar 61. 31 Mar 61, 103p. incl. illus. tables, 37 refs.
(Contract DA 18-108-405-cml-297)
Unclassified report

DESCRIPTORS: *Polymers, *Polymerization, *Ethylenes, *Styrenes, Fluorides, Fluorination, Chlorination, Bromination, Halogenation, Nitration, Molecular structure, Synthesis, Chemical reactions, Aging, Solvent action, Chemical warfare agents, V-agents, G-agents, Catalysts, Catalysis, Metalorganic compounds, Chemical properties.

The relationship between the polymer structure and its resistance to the chemical agents are correlated with their chemical and solubility behavior. Improvement in chemical resistance has been achieved through the preparation of cross-linking or net-work polymers, chemical modification of existent polymers, and stereospecific polymerization of several olefins, styrenes and substituted styrenes. (Author)

AD-256 659 Div. 4
(26 May 61) OTS price $1.60

Ohio State U. Research Foundation, Columbus.
STUDY OF NITRATED CARBOHYDRATES,
by M. L. Wolfrom. Final rept. 1 Feb 59-31 Jan 61. Feb 61, 39p. incl. illus. table, 27 refs. (Rept. no. 901)
(Contract DA 33-019-ORD-2923, Proj. TB2-0001)
(AROD rept. no. 2317:3, 2) Unclassified report

DESCRIPTORS: *Carbohydrates, Nitration, Synthesis, Chemical reactions, Hydroxides, Glucosides, *Isomaltose.

Investigations were made of the synthesis and reactions of nitrated compounds. The study included the synthesis of nitrated carbohydrates with 2 free hydroxyl groups and of compounds containing alpha-D-glucosidic bonds. The following paper is included: A CHEMICAL SYNTHESIS OF ISOXALTOSE, by M. L. Wolfrom, A. O. Pittet, and I. C. Gillan: The synthesis of 3,4,6-tri-O-acetyl-2-O-nitro-beta-D-glucopyranosyl chloride,

a substance with a non-participating group at C-2, furnishes a new approach to the synthesis of the alpha-D-glucopyranosyl linkage. The halide is rather unreactive but the addition of catalytic amounts of silver perchlorate to the Koenigs-Knorr reaction greatly facilitated the formation of the alpha-D-glucopyranosyl bond. Methanolysis of the halide with subsequent denitration and reacylation furnished methyl alpha-D-glucopyranoside (tetraacetate) in 78% yield. Reaction with 1,2,3,4-tetra-O-acetyl-beta-D-glucopyranose furnished isomaltose (beta-octaacetate) in 60% yield together with a small amount (6%) of gentiobiose (beta-octaacetate).

AD-256 709 Div. 4, 7
(29 May 61) OTS price $6.60

Kellogg M. W. Company, New York, N. Y.
PRELIMINARY PROCESS STUDIES ON THE GENERATION OF HYDROGEN FOR SMALL FUEL CELL SYSTEMS,
by H. Ozkardes and W. C. Schreiner. 20 Mar 61. 62p. incl. illus. tables. (Rept. no. CE-61-211)
(Contract DA 44-009-eng-4578)
Unclassified report

DESCRIPTORS: *Fuel cells, *Hydrogen, *Power supplies, Production, *Gas generating systems, Processing, Purification, Hydrocarbons, Liquids, Design.

Alternate generation and purification systems were evaluated to determine the most suitable combination for making pure H from liquid hydrocarbons to supply small fuel-cell power plants. Preliminary designs were made for 2000 and 50 standard cubic feet per hour (SCFH) capacity units and thermal efficiencies, weights, volumes, and operating requirements determined. An analysis of thermal losses was made for each plant. It was concluded that steam reforming followed by water-gas shift was best suited as a generation system under all circumstances considered in this study but purification methods were greatly influenced by capacity. Feed desulfurization is essential for the 2000-CFH plant requirements but might well be eliminated at the 50-CFH level. The use of a Pd diffuser for obtaining pure H is highly desirable for the smaller plant and may also be so at the 2000 CFH level. The use of monoethanolamine absorption to remove CO2 followed by conversion of CO to methane is practical for the larger plant but not for the smaller. The procedures and controls required for start-up, shut-down and normal plant operation are described. Constant operator attendance is required during the first 2 operations while moderate supervision will suffice during the normal operating period. (Author)

AD-256 751 Div. 4, 8
(31 May 61) OTS price $4.60

Eagle-Picher Research Labs., Miami, Okla.
PREPARATION OF ELECTRONIC GRADE SILICON VIA THE IODIDE PROCESS,
by John T. Buford, R. J. Starks and others. Final rept., 1 Oct 57-15 Mar 61. 15 Mar 61, 39p. incl. illus. tables.
(Contract AF 19(604)3057)
(AFCRL 192)
Unclassified report

DESCRIPTORS: *Silicon compounds, *Iodides, *Silicon, Synthesis, Purification, Zone melting, Dissociation, Processing, Transistors, Fractionation, Semiconductors, Chemical impurities, Single crystals, Preparation.

The development of the synthesis process for silicon tetraiodide, and the subsequent purification processes are described. The thermal dissociation systems for silicon tetraiodide utilizing silicon or quartz substrates, or a combination of the two, are described. The development of a continuous system for the preparation of electronic grade silicon via the iodide is presented. The system includes the processes of synthesis, primary purification by distillation, zone melting and thermal dissociation of silicon tetraiodide. The purification factors obtained in the process, as determined by the base boron level of the silicon produced, are presented. (Author)

AD-256 766 Div. 4
(31 May 61) OTS price $2.60

Naval Ordnance Lab., Corona, Calif.
SURVEY OF TRIMETHYLALUMINUM-HYDRAZINE COMPLEXES,
by Neil R. Fetter and Bodo Bartocha. 15 Apr 61, 23p. incl. illus. 14 refs.
(NAVWEPS rept. no. 7171)
Unclassified report

DESCRIPTORS: *Complex compounds, Polymers, *Aluminum compounds, *Hydrazines, Methyl radicals, *Methyl hydrazines, Chemical analysis, Quantitative analysis, Gases, Infrared spectroscopy, Determination, Alkyl radicals, Synthesis, Chemical reactions, Molecular weight.

The complexing of trimethylaluminum and trimethylaluminum trimethylamine with hydrazine, methylhydrazine, 1,1-dimethylhydrazine, 1,2-dimethylhydrazine, trimethylhydrazine, and tetramethylhydrazine has been carried out by means of two general reactions: (1) R3Al + H2NNR'2 yields R3Al:NH2NR'2; and (2) R3Al:NH2NR'2 yields R2Al - NHNR'2 + RH. Elemental analyses, quantitative gas measurements, and infrared spectra are presented as supporting evidence for the formulas given above. (Author)

AD-256 811 Div. 4
(29 May 61) OTS price $5.60

Pennsalt Chemicals Corp., Wyndmoor, Pa.
SULFUR-NITROGEN SYSTEMS IV. EVALUATION OF SULFAMIDE-MELAMINE-FORMALDEHYDE POLYMERS,
by R. A. Florentine, G. Barth-Wehrenalp and others. Mar 61, 49p. incl. illus. tables (Technical rept. no. 20)
(Contract Nonr-268700)
Unclassified report

DESCRIPTORS: *Polymers, *Sulfur compounds, *Nitrogen compounds, *Polymerization, *Formaldehyde, *Amides, Molecular structure, Chemical reactions, Decomposition, Acids, Catalysts, Oxygen, Stability, Temperature, Synthesis, Analysis, Catalysis.

Acid- and base-catalyzed polymers involving sulfamide, melamine, and formaldehyde were prepared and evaluated. The products are extremely resistant to chemical attack, but their lack of

thermal stability (decomposition at 225 C in N) limits their usefulness for high-temperature applications. Based on the relative thermal stabilities of acid- and base-catalyzed compositions, of both the ternary polymers and those from condensations of sulfamide and formaldehyde, it is suggested that acid-catalysis favors asymmetrical polymerization about the sulfamide fragment. Thermal decomposition at 225 C of the acid-catalyzed product may provide a novel polymerization route to C-N-C- polymer chains. Basic catalysis favors symmetrical polymerization around -SO2- but can produce both di- and tetra-functional sulfamide fragments in the polymerization. The reaction at 225 C of sulfamide-formaldehyde 1:4 compositions with melamine suggests that basic catalysis can lead to the inclusion of reactive methylol groups as side groups in the polymer. Thermal polymerization of melamine with these -CH2OH groups appears to occur at 225 C. (Author)

AD-256 870 Div. 4, 25
(31 May 61) OTS price $5.60

Ultrasonics Research Lab., Western Reserve U., Cleveland, Ohio.
COLLOIDAL VIBRATION POTENTIALS IN SILICA SUSPENSIONS,
by Joseph Dereska, Ernest Yeager, and Frank Hovorka. 1 Dec 60, 47p. incl. illus. tables (Technical rept. no. 23)
(Contract Nonr-143904, Proj. NR 384-305)
Unclassified report

DESCRIPTORS: *Colloids, *Silicon compounds, *Dioxides, *Vibration, Ions, Electrolytes, Mathematical analysis, Ultrasonic radiation, Electric potential, Oscillation, Sound.

Ultrasonic waves transmitted through a colloidal suspension in a liquid produce alternating potentials within the suspension (colloidal vibration potentials), because the sound waves produce a periodic distortion of the diffuse ionic layer surrounding each colloidal particle. Each colloidal particle with its ionic atmosphere acts as an oscillating dipole. The effect is used to study the properties of the diffuse ionic layer surrounding each colloidal particle. Quantitative measurements of this effect were made in silica suspensions with pulse-modulated ultrasonic waves at frequencies from 200 to 1200 kc./sec. The experimental values for the colloidal vibration potentials are in reasonably good agreement with values calculated from the treatment of this effect by Enderby, particularly for suspensions of relatively high specific conductance. (Author)

AD-256 887 Div. 4, 25
(2 June 61) OTS price $3.60

Eastern Nazarene Coll., Wollaston, Mass.
REACTIONS OF ALUMINUM BOROHYDRIDE,
by P. Calvin Maybury. Final rept. 20 Apr 61, 32p. incl. illus. tables, 29 refs.
(Contract AF 18(603)119)
(AFOSR-585) Unclassified report

DESCRIPTORS: *Aluminum compounds, Isotopes, *Borohydrides, *Exchange reactions, *Boron compounds, Reaction kinetics, *Deuterium, Chemical reactions, *Deuterated compounds, *Ammonia, *Diboranes, Hydrogen.

KINETICS OF THE EXCHANGE REACTION OF AL(BH4)3 WITH D2: Preliminary studies indicated a drift in exchange rates as calculated by the exchange law, especially for those runs where the ratio of D2 to Al(BH4)3 pressure was large. The assumption was made that the drift was due to the contribution of 2 different mechanisms proceeding at different rates. DEUTERIUM EXCHANGE BETWEEN B2D6 and AL(BH4)3: The kinetics of the exchange were studied from -70 to 20 C. The orders of reaction were dependent on the relative proportions of B2D6 and Al(BH4)3. A mechanism was proposed involving the thermal dissociation of both Al(BH4)3 and B2D6 followed by a rate determining collision of B2D6 with borane radicals. Evidence was obtained proving that the B atoms undergo exchange in this reaction by the use of B-10-enriched B2D6. THE REACTION OF AL(BH4)3 WITH NH3: The Al(BH4)3-NH3 reaction product was obtained as a uniform white amorphous appearing powder which dissolved in cold water with slow gas evolution. The solid was ignited with a laboratory burner flame and burned smoothly with a green flame. IR spectroscopy indicated that some B-H bonds remain intact in the ammoniated Al(BH4)3.

5. COMMUNICATIONS

AD-256 584 Div. 5
(25 May 61) OTS price $17.50

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
INVESTIGATION OF DIGITAL DATA COMMUNICATION SYSTEMS,
by John G. Lawton. 3 Jan 61, 1v. incl. illus. tables, 84 refs. (Rept. no. UA-1420-S-1)
(Contract AF 30(602)2210)
(RADC TR 61-58) Unclassified report

DESCRIPTORS: Data transmission systems, Digital systems, *Communication systems, Phase shifters, Modulators, Mathematical analysis, Frequency modulation, *Pulse communication systems, Amplitude modulation, Errors, *Communications theory, Signal-to-noise ratio, Coding, Multiplex transmission.

Analyses are presented on a variety of topics related to the transmission of digital data. The performance of several types of Phase Shift Keyed (PSK) systems, as determined by the relationship of the error probability to signal-to-noise ratio, is examined. Coherent, differentially coherent, binary and m-state PSK systems, and the effects of frequency offset, cross-talk and thermal noise on the performance of these systems are considered. The performance of m-state differentially coherent multiplexed PSK data links operating over a Rayleigh fading tropospheric scatter link is analyzed. The properties of impulse noise are examined and the effect of impulse noise on digital systems using close-packed codes are investigated. Moment detection, which refers to a decision technique based on the use of temporal moments is investigated both analytically and experimentally. (Author)

AD-256 636 Div. 5, 18
(26 May 61) OTS price $7.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
PEOPLE, ORGANIZATIONS AND COMMUNICATIONS. AN OPERATIONS RESEARCH STUDY OF ARMY COMMUNICATIONS. PHASE I. A MODEL FOR COMMUNICATIONS SYSTEM ANALYSIS,
by Joel N. Bloom, Clifton E. Mayfield, and Richard M. Williams. Interim report. June 60 rev. Mar 61. 1v. incl. illus. 59 refs. (Rept. no. I-A2313-1)
(Contract DA 36-039-sc-78332)
Unclassified report

DESCRIPTORS: *Communication systems, Data, Collecting methods, Errors, Information theory, *Military communications, Military organizations, Operations research, Human engineering, Effectiveness.

A methodology is being developed for assessing the effectiveness of the human and organizational elements in military communication networks in terms of a trade-off between the control of error and the delay involved in error control. Since all information to be transmitted by the system does not inherently require equal freedom from error and delay, the concept of Tolerable Error and Tolerable Delay based on an information characterization scheme is introduced. Information is characterized in terms of its (1) urgency, (2) importance, and (3) policy status. Delay and error control are then measured and examined as functions of these information characteristics. Conceptually, messages are considered to flow from source commander to destination commander, with the action officers, releasing officers, staff message agencies, and the like considered as system elements. Total error and delay, and their interactions, are then measured from commander to commander. Individual error components are postulated to permit evaluation of the effectiveness of specific message processing phases, such as preparation, coordination, review, and release. (Author)

AD-256 704 Div. 5, 12, 15, 25
(29 May 61) OTS price $3.60

General Precision Lab., Inc., Pleasantville, N. Y.
OPTICAL COMMUNICATION BETWEEN A RE-ENTRY VEHICLE AND THE EARTH, PART I,
by Seymour Sherman. Dec 60, 1v. incl. illus. tables. (Rept. no. A24-1)
(Contract AF 30(602)2203, Proj. 4519)
(RADC TN 61-42A) Unclassified report

DESCRIPTORS: *Optical systems, Communication systems, *Light communication systems, *Re-entry vehicles, Mirrors, Signal to noise ratio, Photoelectrons, Statistical distribution.

An optical communication system betwen a re-entry vehicle and the earth is analyzed to determine source spectral radiances and signal-to-noise ratios as functions of system parameters. The optical system includes an extended source, modulator, and transmitting mirror for each transmitting system, the atmosphere as a transmission medium, and a receiver mirror, filter, and detector for each receiving system. Noise was considered to be due to radiation from the re-entry body, daylight (sunlight scattered from the atmosphere) and sunlight back-scattered from the earth; the dark currents of the multiplier phototubes used as the detectors are shown to be negligible. (Author)

AD-256 756 Div. 5, 12
(31 May 61) OTS price $5.60

ITT Kellogg, Chicago, Ill.
FIXED GROUND COMMUNICATION SYSTEMS WEAPONS SYSTEM 107A-1.
Program progress rept. no. 48 for Apr 61.
Apr 61, 1v. incl. illus.
(Contracts AF 04(647)123, AF 04(647)312, AF 04(647)461, AF 04(647)462, AF 04(647)486, AF 04(647)495, AF 04(647)502, AF 04(647)503, AF 04(647)566, AF 04(647)608, AF 04(647)609, AF 04(647)738, AF 04(647)739, AF 04(647)740, AF 04(647)741, AF 04(647)747, and AF 04(647)811)
Unclassified report

DESCRIPTORS: *Guided missiles, Surface to surface, *Satellite vehicles, *Ground support equipment, Surface to air, *Public address systems, *Communication equipment, *Communication systems, Quality control, Installation, Launching, Maintenance, *Loudspeakers.

AD-256 757 Div. 5, 12
(31 May 61) OTS price $1.10

ITT Kellogg, Chicago, Ill.
FIXED GROUND COMMUNICATION SYSTEMS WEAPONS SYSTEM 107A-2.
Program progress rept. no. 48 for Apr 61.
Apr 61, 5p.
(Contract AF 04(647)298)
Unclassified report

DESCRIPTORS: *Guided missiles, Surface to surface, *Ground support equipment, Fire detectors, *Communication equipment, *Communication systems, Installation, Recording devices, Amplifiers.

6. DETECTION

AD-256 000 Div. 6, 8
(17 May 61) OTS price $14.50.

Convair, Fort Worth, Tex.
AN/APQ-69 (XH-1) HIGH RESOLUTION RADAR. PART II. DESCRIPTION OF SYSTEM OPERATION, OPERATING AND ADJUSTMENT PROCEDURES.
Rept. on Reconnaissance Radar Set, AN/APQ-69(XH-1). Jan 61, 206p. incl. illus. tables.
(Contract AF 33(600)32517, Proj. 6246)
(WADD TR 61-104, pt. 2) Unclassified report

Division 6 - DETECTION

DESCRIPTORS: *Aerial reconnaissance, Airborne, Radar equipment, *Search radar, *Mapping, *Radar scanning, *Instruction manuals, Radar antennas, Operation, Radar transmitters, Radar receivers, *Electronic circuits, X band,

The AN/APQ-69(XH-1) high resolution radar system components are described physically. The functional operation of the various circuits is described. The operation of the equipment is described in some detail; however, the equipment procured for the system on an off the shelf basis is described only to the extent that it has been modified to make it compatible with the rest of the system. Operating procedures are given that provide the information needed to operate the equipment on the ground and during flight. A section devoted to film processing is included in the operating procedures. Adjustment procedures are called out for the various controls and alignment adjustments with the exception of the operating controls. (Author)

AD-256 238 Div. 6, 2, 12
(19 May 61) OTS price $3.60

Allied Research Associates, Inc., Boston, Mass.
INTERPRETATION OF SATELLITE OBSERVATIONS OF INFRARED RADIATION,
by Raymond Wexler. 20 Apr 61. 31p. incl. illus. tables. (Scientific rept. no. 1)
(Contract AF 19(604)5968)
(AFCRL-457) Unclassified report

DESCRIPTORS: *Infrared radiation, *Satellite vehicles, Satellite vehicle research, Measurement, Atmosphere, Absorption, Infrared optical systems, *Infrared spectroscopy, Infrared windows, Clouds, Blackbody radiation, Mapping, Analysis, Theory.

An analysis was made of some new data on absorption in the 15 micron CO2 band, and corrected values of atmospheric transmission in this region were obtained. An analysis of the window region was also made. The problem of transforming the radiation measured in a small solid angle near the vertical to hemispherical radiation was considered. Examples of window maps with superimposed cloud analyses from TIROS I photographs are presented. A map of the total outgoing radiation between 4 and 40 microns along the vertical over the United States from the Rockies to the Atlantic is shown. (Author)

AD-256 357 Div. 6, 12
(23 May 61) OTS price $9.60

Smyth Research Associates, San Diego, Calif.
TARGET ACCURACY EXPERIMENT.
Final rept., Apr 61, 1v. incl. illus. tables.
(Rept. no. SRA-172)
(Contract AF 30(602)2084)
(RADC TR 61-63) Unclassified report

DESCRIPTORS: *Satellite vehicle trajectories, *Doppler tracking, Test facilities, Tests, Radiosondes, Refractive index, Atmospheric refraction, Interferometers, Detection, *Tracking, Radio equipment, Reliability, *Doppler systems, Orbital flight paths, Recording systems, Test equipment, Aerosol targets, *Satellite vehicles, Ballistic cameras, Errors.

The accuracy with which a target moving above the ionosphere can be located and tracked was studied. The principal line of attack on the basic problem was to measure, by radio techniques, the apparent position of radio satellites as they pass within the line of sight of a ground receiving station, and to compare the apparent position with the true position over a range of elevation angles. These measured deviations were then compared with deviations calculated using available refractive index data which are representative of the area and time in which the measurements were taken. Since it was recognized that these deviations are greatest at low elevation angles, and that it is of greatest importance to detect and track at low elevation angles, the work was concentrated on elevation angles below 15 degrees. (Author)

AD-256 402 Div. 6
(22 May 61) OTS price $1.60

Pan American World Airways, Inc., Patrick Air Force Base, Fla.
AGA C/T MOD II C-BAND BEACON,
by F. H. Dyke. Electrical test rept. 3 May 61, 11p. illus.
(In cooperation with RCA Service Co.)
(AFMTC TN 61-4) Unclassified report

DESCRIPTORS: Superhigh frequency, *Radar beacons, Transistors, C band, Radar transmitters, Power supplies, Radar receivers, Tests, Guided missile tracking systems.

A limited series of tests were conducted to verify the electrical characteristics of the AGA C/T Mod II C-band beacon serial number 48. It is contemplated to use this beacon with the Transit vehicle for Range Safety and metric data gathering. The AGA C/T Mod II beacon is a miniaturized C-band unit consisting of a single package. The beacon is completely transistorized with the exception of the local oscillator and magnetron tubes, operates from an input voltage of 24.5 to 31 vdc, employes a superheterodyne receiver, has provisions for interrogation by either a single pulse or a two pulse code, and transmits medium r-f power. A list of specified characteristics of the beacon is included. (Author)

AD-256 516 Div. 6, 17, 25
(23 May 61) OTS price $11.50

Radio Corp. of America, Harrison, N. J.
IMPURITY ACTIVATED ALLOY INFRARED DETECTORS,
by K. S. Ling. Summary rept. 31 Jan 61, 125p. incl. illus. tables, 5 refs.
(Contract AF 33(616)6249, Proj. 4056)
(WADD TR 61-140) Unclassified report

DESCRIPTORS: *Infrared detectors, *Germanium alloys, *Silicon alloys, *Gold alloys, Materials, Theory, Photoconductivity, Impurities, Electrical properties, Zinc alloys, Crystals, Growth, Infrared radiation, Tests, Test equipment.

A theoretical analysis of 3 types of detector materials is presented. Theory predicts that gold doped germanium-silicon alloy material with the long wavelength threshold at 7 microns should have higher detectivity at the operating temperature of liquid nitrogen than has been realized with other detectors for this wavelength range.

The zinc doped germanium-silicon alloy material has high detectivities in the 8 to 13 micron atmospheric window at the operating temperature of 50 K. Equipment and procedure to prepare monocrystalline germanium and germanium-silicon alloy are described in detail. Cell fabrication technique and equipment and the method of evaluation of the cells are also described. The theory of the performance of the germanium and germanium-silicon alloy system is given. Detailed analysis of cell response with respect to infrared radiation and analysis of conductivity with respect to impurity concentration are presented. (Author)

AD-256 524 Div. 6, 25
(23 May 61) OTS price $10.50

Syracuse U. Research Inst., N. Y.
INFRARED DETECTORS,
by Henry Levinstein. Interim rept. no. 5, 1 Feb-30 Apr 61. 1 May 61, 124p. incl. illus. table, 53 refs. (Physics rept. no. 104-6)
(Contract AF 33(616)6741, Proj. 4056)
Unclassified report

DESCRIPTORS: *Infrared detectors, Materials, *Semiconductors, Crystals, Photoconductivity, Infrared radiation, Impurities, Indium alloys, Antimony alloys, Manufacturing methods, Measurement, Detectors, *Crystal structure, Gold alloys, Silver alloys, Copper alloys, Nickel alloys, Temperature, Preparation, Tests, Test equipment, Germanium, Silicon, Detection, Hall effect.

InSb was prepared with Cu, Ag, Au, and Ni impurities. The energy levels produced by these impurities were investigated. All of the elements of the Ib column of the periodic table behave similarly and produce two deep acceptor energy levels in InSb. This behavior is expected when elements of valence one substitute for the indium atoms of the lattice. Only one deep acceptor energy level located 0.057 ev from the valence band was found for nickel as an impurity. For copper, a value of 0.023 ev above the valence band was found for the lower level. Energies of 0.022 and 0.032 ev were obtained for the lower levels of Ag and Au, respectively. Evidence that gold possesses amphoteric properties in InSb as it does in Ge and Si is also presented. Saturation limits and segregation constants of these impurities were determined. (Author)

AD-256 548 Div. 6, 8
(24 May 61) OTS price $3.60

Litton Systems, Inc., College Park, Md.
DIRECTION FINDER GROUP AN/TLA-9 (FORMERLY OA-(XE-1)/VRD),
by J. DeStefano. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61. 31 Mar 61, 1v. incl. illus.
(Contract DA 36-039-sc-84961)
Unclassified report

DESCRIPTORS: *Direction finding, Antennas, Countermeasures, *Radio interception, *Radar interception, Radio signals, Radar signals, Radomes, Servo systems, Parabolic antennas, *Bearing finding, *Electronic circuits, Microwave equipment, Antenna hardware, Ultra high frequency, Design, Superhigh frequency, Cathode ray tubes, Power supplies.

Final packaging design of the AN/TLA-9 system was completed and fabrication of the component parts is approximately 60 percent complete. Design of the servo system was also completed and successfully temperature-cycled. Preliminary electrical tests were conducted on the final configuration of the antenna and radome assemblies with satisfactory results. Electrical assembly of the final unit was started. (Author)

AD-256 559 Div. 6, 12, 19
(24 May 61) OTS price $15.00

General Mills, Inc., Minneapolis, Minn.
STELLAR ABERRASCOPE STUDY,
by R. Lillestrand, J. Hamilton and others.
Final rept. June-Dec 60. Dec 60, 1v. incl. illus. tables, 24 refs. (Rept. no. 2142)
(Contract AF 33(616)7400, Proj. 5216)
(WADD TR 61-78) Unclassified report

DESCRIPTORS: *Satellite vehicle trajectories, *Optical tracking, *Celestial navigation, *Star trackers, Stars, Atmospheric refraction, Absorption, Instrumentation, Tests, Satellite attitudes, Optical systems, Infrared radiation.

A satellite orbiting about a celestial body, equipped with a device for star tracking, will observe that the stars sometimes pass behind or emerge from the limb of the body. It is shown that a measurement of the times of six independent horizon star transits will permit the determination of the six parameters of the satellite orbit with respect to inertial space. From the orbital elements, the altitude and subsatellite point can be determined as a function of time in a self-contained manner. It is proposed that star transit measurements be made while the light ray is still high in the atmosphere. The time of star transit can then be defined as that instant at which the refraction or the attenuation of a star image has built up to some predetermined value. Each celestial body requires special study based on the characteristics of its atmosphere - if it has any. In the case of the earth an investigation has been made of the use of atmospheric refraction or spectral absorption at altitudes ranging from 100,000 to 200,000 feet. As a result it appears that rms errors in the altitude of the constant density surface will not exceed a distance of one mile. (Author)

AD-256 587 Div. 6, 25
(25 May 61) OTS price $6.60

Honeywell Research Center, Hopkins, Minn.
INTRINSIC INFRARED DETECTOR RESEARCH,
by Paul W. Kruse, M. Don Blue and others. Interim engineering rept. no. 1. 15 May 61, 1v. incl. illus. tables (Serial no. 36200)
(Contract AF 33(616)7901)
Unclassified report

DESCRIPTORS: *Infrared detectors, Mercury compounds, Selenides, Materials, *Crystals, *Semiconductors, Growth, Preparation, Hall effect, *Thermochemistry, Photoconductivity, Heat treatment, Design, Photons, Lattices, Electrical properties, Life expectancy, Temperature.

Research is aimed toward the development of an intrinsic infrared detector having a spectral response extending from less than 7.5 microns to greater than 14.5 microns. The peak response should lie between 7.5 and 14.5 microns. The time constant should be extremely short, preferably shorter than 1 microsecond. The cooling requirements should be reduced as much as possible without significant degradation of detector performance. The initial element size should be in the 1 sq. mm region. The envelope should employ fused seals and be capable of repeated cycling between room temperature and operating temperature. The binary compound semiconductor mercury selenide, HgSe, was prepared and evaluated as an intrinsic infrared detector material for the 8 to 14 micron spectral region. Theoretical thermochemical analyses supports the experimental evidence that the production of p-type HgSe in an equilibrium reaction is unlikely. Theoretical analyses of the relationship between Auger and radiative recombination as a function of temperature are presented. The performance of HgSe in the photoconductive and photoelectromagnetic modes was calculated. Detectors based upon the PEM effect in HgSe at room temperature were constructed. Spectral response measurements were made. (Author)

AD-256 648 Div. 6, 8
(26 May 61) OTS price $1.60

Stanford Electronics Labs., Stanford U., Calif.
SOME DESIGN FACTORS AFFECTING PULSE AND C-W SENSITIVITY OF TWT CRYSTAL-VIDEO RECEIVERS,
by N. W. Taussig. 28 Apr 61, 16p. incl. illus.
(Technical rept. no. 616-1)
(Contract AF 33(616)6207)
Unclassified report

DESCRIPTORS: *Traveling wave tubes, Electron tubes, *Crystal video receivers, Detection, *Radar receivers, Radar pulses, Sensitivity, Radar signals, Preamplifiers, Mathematical analysis, Amplitude modulation, Signal-to-noise ratio, Broadband, Design.

Research is concerned with two aspects of the design of a receiver which is employed for simultaneous reception of pulse and CW signals. The first deals with the gain characteristic of the RF preamplifier that is used. This gain characteristic must be uniform over the frequency pass band of interest in order to maintain maximum sensitivity. If the gain is not uniform, the sensitivity over the portions of the frequency pass band with lower gain will be degraded from the maximum capabilities of the components used. Examples of this degradation are given. Methods of detecting a CW signal are presented. To do this detection, a modulator must be inserted before the RF preamplifier. According to the modulation waveform of the CW signal, it is possible to use a narrow-band detection amplifier. Curves are presented which relate the unity S/N sensitivities for pulse and CW reception. (Author)

AD-256 752 Div. 6, 8
(31 May 61) OTS price $4.60

Granger Associates, Palo Alto, Calif.
STUDY OF OPTIMIZATION OF AIRBORNE DIRECTION FINDING SYSTEMS IN THE VHF-UHF FREQUENCY RANGES,
by Howard Sklar. Final rept. 1 May 61, 1v. incl. illus. tables.
(Contract AF 19(604)5509)
(AFCRL 319)
Unclassified report

DESCRIPTORS: Very high frequency, Ultra high frequency, *Direction finding, *Bearing finding, Airborne, Errors, Reduction, Communications theory, Harmonic analysis, Antennas, *Antenna radiation patterns, Analysis, Electromagnetic waves, Scattering, Interception, Signal-to-noise ratio, Radio waves, Model tests, Detectors, *Airplane antennas.

A new method for reducing the bearing errors associated with present day VHF-UHF airborne direction finding systems was studied. The method is essentially that of incorporating an ideal detector into the receiver section of a DF system. Initially the problem was treated as one in communication theory by considering the pattern distortions as additive random noise. Alternate approaches investigated included use of the information contained in recorded DF patterns to optimize the detector. A formal solution employing this approach was obtained but to obtain numerical answers would have involved computer programming difficulties beyond the scope of this study. Analysis of available DF patterns showed that operating on a single harmonic of a DF pattern instead of the entire pattern resulted in increased bearing accuracy. The instrumentation necessary to determine bearing from a single harmonic is relatively simple. A number of the techniques investigated may provide bearing error reduction. The single harmonic technique shows the greatest promise. (Author)

7. ELECTRICAL EQUIPMENT

AD-256 021 Div. 7
(18 May 61) OTS price $13.50

R. E. D. M. Corp., Singac, N. J.
XM5 BAROSWITCH ASSEMBLY. PRODUCTION ENGINEERING STUDY.
Final rept. 1961. 1v. incl. illus.
(Contract DA 28-017-501-ORD-2847)
Unclassified report

DESCRIPTORS: *Pressure switches, Tests, Design, Switches, Ordnance, Barometric pressure, Vibration, Shock resistance.

The pressure Baroswitch is a stock capsule design of a major pressure capsule manufacturing concern. The capsule involved is made to a ± 0.25% linearity with pressure and a total deflection rate variability of 10%. Capsules meeting these requirements and used in conjunction with the bar linkage compensating mechanism provide satisfactory operating characteristics. The use of stock capsules has provided a major step to increasing the produceability. In addition, the ability of a number of capsule manufacturing concerns to uniformly produce capsules required in this Baroswitch greatly reduced the amount of pre-calibration of selective assembly. Capsule fittings and contacts are fabricated by normal furnace brazing techniques. Element enclosures are accomplished both by induction brazing, and inert atmosphere welding. Standard equipment of this nature plus a few relatively simple fixtures are all that are required. Incorporating a simple linkage design into the gear train has eliminated the need for complicated cam operated differentials. Selective assembly of gears for proper slope correction has been eliminated by a simple variable slide on the lever assembly. (Author)

AD-256 314 Div. 7, 26
(19 May 61) OTS price $1.60

Sprague Electric Co., North Adams, Mass.
INDUSTRIAL PREPAREDNESS MEASURES ON SOLID ELECTROLYTE BATTERIES,
by S. B. Williams and A. G. Ceely. Quarterly rept. no. 9, 1 Jan-31 Mar 61. 31 Mar 61, 13p. incl. tables.
(Contract DA 36-039-sc-81251)
Unclassified report

DESCRIPTORS: *Electrolytic cells, *Storage batteries, *Dry cells, Production, Test methods, Manufacturing methods, Temperature, Quality control, Tests.

A number of preproduction batteries were tested for O.C.V. (open-circuit voltage) at plus 125 F and minus 25 F. All passed the test requirements. No further problems are expected in the manufacture of these batteries. (Author)

AD-256 412 Div. 7, 26
(22 May 61) OTS price $1.60

Ray-O-Vac Co., Madison, Wis.
LOW TEMPERATURE BA-2270/U-XLT-1 BATTERIES,
by J. W. Paulson. Interim rept. no. 2, 15 Aug 60-15 Feb 61. 28 Feb 61, 11p. tables
(Contract DA 36-039-sc-78144)
Unclassified report

DESCRIPTORS: *Low temperature batteries, *Dry cells, Storage batteries, Production, Tests, Lithium compounds, Chlorides, Bromides, *Electrolytes, Test equipment, Battery separators, Life expectancy.

Six months delayed results are reported for in-plant testing of production run batteries at -40 F, -20 F and 70 F. The lithium chloride electrolyte was employed in combination with a separator designated as CP-2 paper. (Author)

AD-256 485 Div. 7, 25
(23 May 61) OTS price $4.60

General Atomic Div., General Dynamics Corp., San Diego, Calif.
RESEARCH ON CESIUM-VAPOR CELLS EMPLOYING CARBIDE CATHODES,
by R. W. Pidd and H. L. Garvin. Yearly technical summary rept. 1 May 60-31 Jan 61. 7 Feb 61, 43p. incl. illus. 10 refs. (Rept. no. GA-1973)
(Contract Nonr-319300, Proj. 94.00)
Unclassified report

DESCRIPTORS: *Thermionic emission, *Cesium, Vapors, Carbides, Cathodes, Measurement, Zirconium compounds, Uranium compounds, Diodes, Temperature, Ions, Production, *Power supplies, *Thermoelectricity, Design.

The performance of cesium thermionic cells employing carbide cathodes is being studied. Vacuum emission studies were made on cathode materials containing ZrC and UC of various proportions. A cathode of ZrC0.80 - UC0.20 solid solution was installed in a cesium thermionic diode and studies were made of the electrical output characteristics, ion generation mechanism, and effective electron temperatures at various cesium pressures. From the measurements made on high-UC-content carbide samples, the thermionic emission characteristics were determined to closely approximate the published results for pure UC samples. Some of the results obtained using low-UC-content emitters fell below the values observed in other laboratories. The performance characteristics of cesium cells employing carbide cathodes are fairly well identified and understood for intermediate-to-low cesium pressures 1/10,000 mm Hg and below) and low cathode temperatures. However, for higher pressures and cathode temperatures above 2000 K, the mechanisms of operation appear to be complex. There is preliminary evidence that interelectrode spacing will strongly influence the operation of high-power-density converters. (Author)

AD-256 579 Div. 7, 6
(25 May 61) OTS price $1.10

Army Infantry Board, Fort Benning, Ga.
EVALUATION OF MODIFIED ENGINE GENERATOR SET PU-422/U FOR USE WITH RADAR SET AN/PPS-4(T).
28 Apr 61, 5p.
(Proj. no. 2954)
Unclassified report

DESCRIPTORS: *Power supplies, Transistors, *Internal combustion engines, *Generators, *Search radar, Radar equipment, Tests.

Efforts were made to determine the capability of Modified Engine Generator Set PU-422/U to (1) provide suitable power for use with the Radar Set AN/PPS-4, and (2) suitably charge NICAD Battery BB-422/U and concurrently provide suitable power to the AN/PPS-4 Radar. The Modified Engine Generator Set PU-422/U is an air-cooled, one-cylinder, 4c internal combustion engine, rated at 1.5 hp, with an automatic recoil rope starter, a mechanical fly ball type speed regulator, and a magneto type ignition. A permament magnet generator rotor is mounted directly on the engine crankshaft. Test results indicated that the Modified Engine Generator Set PU-422/U is compatible and suitable for use with the Radar Set AN/PPS-4, and is capable of suitably charging NICAD Battery BB-422/U independently or simultaneously while providing suitable power for the AN/PPS-4 Radar. (Author)

AD-256 580 Div. 7, 12
(25 May 61) OTS price $1.10

Army Air Defense Board, Fort Bliss, Tex.
CONFIRMATORY TEST OF GENERATOR SET, 45 KW, 400-CYCLE, PRECISE POWER DED (CUMMINS).
22 May 61, 3p. illus.
(Proj. no. TF-3860)
Unclassified report

DESCRIPTORS: *Antiaircraft defense systems, Diesel engines, *Generators, Tests, Noise, Power supplies, Electric power production, Reliability, Maintenance, Surface-to-air, *Auxiliary power plants, Guided missiles.

The Cummins 45 KW, diesel engine driven (DED) Model JS-6-G generator was given a complete technical inspection and connected to a resistance load board to determine load character-

istics. After the characteristics had been determined the generators were connected in turn to a NIKE HERCULES and to a HAWK missile system to determine their adequacy for supplying power to air defense systems. The tests used with both systems were similar and consisted of two phases. In phase one the generators in turn supplied power for the battery control area equipment. In phase two the generators supplied power to the launcher area equipment. During the test with the HAWK system, special note was taken of the generator interference problem. Generators were tested, also, for transportability, reliability and general ease of maintenance, fuel and oil consumption, and adequacy of the muffler to reduce audible noise. The generators are capable of supplying the required power. (Author)

AD-256 581 Div. 7, 14
(25 May 61) OTS price $1.60

Bright Star Industries, Clifton, N. J.
FLAT CELL MAGNESIUM DRY CELL BATTERIES,
by F. A. Keller. Semiannual progress rept. no. 4, 1 Oct 60-1 Apr 61. 1 Apr 61, 12p. incl. illus.
(Contract DA 36-039-sc-78231)
Unclassified report

DESCRIPTORS: *Dry cells, Storage batteries, *Magnesium electrodes, Zinc electrodes, Adhesives, Varnishes, Coatings, Electrodes, Magnesium alloys, Zinc alloys, Materials.

AD-256 701 Div. 7
(31 May 61) OTS price $9.60

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK.
VOLUME III. DYNAMIC THERMAL CONVERTERS,
by C. W. Stephens, R. Spies, and W. R. Menetrey. Sep 60, 1v. incl. illus. tables, 74 refs. (EOS rept. no. 390-Final)
(Contract AF 33(616)6791, Proj. 4769)
(WADD TR 60-699, vol. 3) Unclassified report

DESCRIPTORS: *Power supplies, *Heat engines, *Turbines, Axial flow turbines, *Generators, Electromagnetism, Induction generators, Electrostatic generators, Van Degraff generators, *Handbooks, Effectiveness, Design, Theory, Thermodynamics, Materials, Space flight, Energy, Steam turbines, Gas turbines, Electric power production, Solar energy, Electromechanical converters.

A detailed discussion is presented of the two dynamic thermal converters which appear most useful in future power systems in the next decade, the Stirling engine and the Rankine cycle turbine. Empirical and theoretical equations are presented describing engine performance, and estimates are made of future performance possibilities with new working fluids, higher operating temperatures, etc. Also discussed are electrostatic and electromagnetic generators which are coupled with the dynamic thermoconverters. Anticipated weights, efficiencies and other performance characteristics are described. (Author)

AD-256 702 Div. 7, 8, 25
(31 May 61) OTS price $9.10

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK.
VOLUME IV - STATIC THERMAL CONVERTERS,
by J. Blair and J. D. Burns. Sep 60, 1v. incl. illus. tables, 33 refs. (EOS rept. no. 390-Final)
(Contract AF 33(616)6791, Proj. 4769)
(WADD TR 60-699, vol. 4)
Unclassified report

DESCRIPTORS: *Power supplies, *Generators, *Thermoelectricity, *Thermionic emission, *Handbooks, Theory, Design, Mathematical analysis, Equations, Materials, Diodes, Plasma physics, Electron tubes, Measurement, Cathodes (Electron tubes), Anodes (Electron tubes), Space flight, Solar energy.

A discussion is given of 2 static thermal converters of prime interest to space power systems, the thermoelectric generator and the thermionic emitter. Empirical and analytical relations describing their performance are presented. Performance is optimized as a function of heat sink and source temperatures, material parameters available at present and anticipated in the future, and fabrication limitations. While the efficiencies of present devices are lower than obtainable with dynamic heat engines, anticipated material improvements will reverse this situation and result in converter efficiencies on the order of 30 to 40 % for thermionic emitters, and 25 to 30 % for thermoelectric generators within the next decade. (Author)

AD-256 748 Div. 7, 25
(1 June 61) OTS price $8.60

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK.
by W. R. Menetrey, Sep 60, 1v. incl. illus. tables (EOS rept. no. 390-Final)
(Contract AF 33(616)6791, Proj. 4769)
(WADD TR 60-699, vol. 9) Unclassified report

DESCRIPTORS: *Solar energy, *Power supplies, *Handbooks, Design, *Solar cells, *Thermoelectricity, Turbines, Generators, *Thermionic emission, Thermocouples, Theory, Photoelectric cells, Storage batteries, Electrochemistry, Reliability, Space environmental conditions, Spaceships, Satellite vehicles, Heat engines, Space flight, Costs.

A summary is given of the anticipated performance of solar power systems over the next decade. This summary is based upon the analytical and empirical relationships describing component performance. Weight, cost, and reliability estimates are presented for photovoltaic power systems, and weight estimates are given for solar-thermal systems. Thermal converters include thermoelectric discs, thermionic emitters, turbo-generators, and the Stirling engine. (Author)

AD-256 755 Div. 7, 8, 14, 26
(31 May 61) OTS price $14.00

General Electric Co., Schenectady, N. Y.
COMPONENT MODES OF FAILURE AND RELIABILITY PREDICTION STUDIES (PULSE CABLES).
Final rept. 1 July 58-31 Jan 61. 31 Jan 61, 1v. incl. illus. tables, 77 refs.
(Contract DA 36-039-sc-78147, Proj. 3G26 01 001)
Unclassified report

DESCRIPTORS: *Pulse cables, *Radiofrequency cables, Reliability, Life expectancy, Failure (Mechanics), Stresses, Tests, Electrical properties, Electric connectors, Dielectrics, Polymers, Ethylenes, Insulating materials, *Electric insulation, Plastics, Mathematical prediction.

Life test data are reported for radio frequency cable RG-8A/U over the voltage range between one and 2.5 times the discharge extinction voltage at frequencies from 60 cps to 10 kc and at temperatures from -17 to +80C. Limited testing of cables RG-14A and 17A/U are also reported. It was determined that modal life is the time required to produce 2.5 x 10 to the 12th power corona discharges on one foot of RG-8A/U or 2.3 x 10 to the 11th power discharges per square inch of outer dielectric surface. This latter value holds also for RG-14A and 17A/U cables. The life of pulse cable RG-156/U and limited work on pulse cables RG-157 and 158/U are also reported. The method of measuring the number of corona discharges per cycle of applied voltage and the termination techniques for conducting such tests are also included. The life behavior of these cables is the same as that of rf cable in that the number of discharges per void to failure is about 1 x 10 to the 9th power and that the lives are equal at equal ratios of applied voltage to discharge extinction voltage. (Author)

AD-256 785 Div. 7, 8
(31 May 61) OTS price $15.50

Raytheon Mfg. Co., Waltham, Mass.
DEVELOPMENT OF HIGH TEMPERATURE TRANSFORMERS WITH NEW CONFIGURATIONS FOR MISSILES AND AIRCRAFT,
by J. Francis Ahearn and Michael I. Meltzer.
Final rept. 1 May 57-30 Nov 60. 30 Nov 60, 222p. incl. illus. tables, 86 refs.
(Contract NObsr-72671)
Unclassified report

DESCRIPTORS: High temperature research, Manufacturing methods, Life expectancy, *Audiofrequency transformers, *Pulse transformers, Embedding substances, Insulating materials, Power transformers, Magnetic materials, Wire, Aging, Airborne, Tests, Brazing, Glass textiles, Welding, Heat transfer, Copper coatings.

Materials and techniques were investigated for the fabrication of transformers to operate with maximum hot spot temperatures of 350 C., and 600 C. Transformers were designed, built, and life tested at the two operating temperature levels. Transformers of four basic types were included in the investigation: low voltage power, high voltage power, audio, and pulse. Maximum voltage ratings were 5400 v for the power and 17,600 v for the pulse transformer. Twelve models of each of the four types designed to operate at 350 C. hot spot were delivered under the contract, and a similar number designed for 600 C. hot spot. Detailed results are presented of investigations of a wide variety of materials and techniques for high temperature transformers. Original work on the development of new potting compounds, insulated magnet wires, flexible inorganic layer insulation, and thermally emissive container surfaces is reported. (Author)

AD-256 812 Div. 7, 20, 25
(29 May 61) OTS price $3.60

Rand Corp., Santa Monica, Calif.
THERMOELECTRIC POWERPLANTS UTILIZING CONTAINED NUCLEAR EXPLOSIONS,
by G. A. Hoffman. 18 Feb 60, 36p. incl. illus. tables (Research memo. no. RM-2490-1)
(Contract AF 49(638)700, Proj. Rand)
Unclassified report

DESCRIPTORS: *Nuclear reactions, Power plants, *Thermoelectricity, *Electric power production, *Nuclear explosions, *Underground structures, *Underground explosions, Costs, Design, Analysis, *Reactor feasibility study.

This study is an early attempt at defining the problem of stationary thermoelectric powerplants that would utilize the thermal energy released by detonating nuclear devices in a closed cavity, surrounded by a heat exchanger. The system may require a capital investment of 2 billion dollars but might produce electric power at a cost competitive with that of conventionally produced power. The results of this study suggest that none of the obstacles is insurmountable. (Author)

AD-256 881 Div. 7, 13, 20, 25
(2 June 61) OTS price $19.75

Airesearch Mfg. Co., Los Angeles, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME VII. HEAT EXCHANGERS,
by A. Haire and L. Hays. Sep 60, 1v. incl. illus. tables, 72 refs. (EOS rept. no. 390-Final)
(Subcontract to Electro-Optical Systems, Inc., Pasadena, Calif., Contract AF 33(616)6791, Proj. 4769)
(WADD TR 60-699, vol. 7) Unclassified report

DESCRIPTORS: *Heat exchangers, *Power supplies, *Heat transfer, Conductivity, Design, Thermal radiation, Convection, Spaceships, Space flight, Boilers, Steam condensers, Materials, *Handbooks, Coatings, Liquid metals, Fluid mechanics, Reflection, Theory, Space environmental conditions, Satellite vehicles, Solar energy, Nuclear energy, Mathematical analysis, Turbines.

Empirical and analytical equations are presented describing the performance of several types of heat exchangers useful in space power systems, including non-phase-change heat exchangers, condensers, boilers, sub-cooling mechanisms, and others. The present state-of-the-art concerning materials compatibility, fabrication techniques, knowledge of environmental deterioration, and other factors is presented. Anticipated weights and practical difficulties encountered in systems operation are discussed. (Author)

AD-256 882 Div. 7, 8, 25
(2 June 61) OTS price $11.00

Electro-Optical Systems, Inc., Pasadena, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME VIII. OTHER DEVICES,
by R. Wall, D. Erway and others. Sep 60, 1v. incl. illus. tables, 41 refs. (EOS rept. no. 390-Final)
(Contract AF 33(616)6791, Proj. 4769)
(WADD TR 60-699, vol. 8) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, Jets, *Handbooks, *Solar energy, Collecting methods, Design, *Detectors, Solar cells, Photoelectric cells, Spaceships, Satellite vehicles, Space flight, *Transducers, *Control systems, *Electromagnetic waves, Jet pumps, Electron beams, Cavitation, *Pumps, Centrifugal pumps, Attitudes, Flywheels, Torque, Transformers, Rectifiers, Inverted rectifiers, Semiconductors, Reliability, *Electronic equipment, *Electrical equipment, Materials.

Volume VIII describes the performance characteristics of several auxiliary components useful in space power systems including orientation mechanisms, pumps, and static conversion and regulation devices. In addition, the magnetohydrodynamic (MHD) generator is analyzed as a thermal energy converter, and the possibilities of using beamed electromagnetic power are discussed. Weight, efficiency, power requirements, and other design characteristics of the auxiliary equipment are presented in empirical and analytical form. It is shown that beamed electromagnetic power does not appear useful until major breakthroughs in antenna design and theory are achieved. The theoretical relations describing the MHD generator and the possibilities of its eventual use in thermal systems are described. (Author)

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-256 001 Div. 8
(15 May 61) OTS price $1.60

Airborne Instruments Lab., Inc., Deer Park, L. I., N. Y.
DEVELOPMENT OF C-BAND REACTANCE AMPLIFIER,
by J. C. Greene, J. Kliphuis, and J. J. Whelehan.
Quarterly progress rept. no. 3, 16 Dec 60-15 Mar 61. 15 Apr 61, 16p. incl. illus. table
(Rept. no. 8412-I-3)
(Contract DA 36-039-sc-85359, Proj. 3619-06-001-02)
Unclassified report

DESCRIPTORS: *Amplifiers, C-band, Silicon, Gallium compounds, Arsenides, *Diodes, Design, Noise (Radio), *Microwave amplifiers, Broadband, Tests, Electronic circuits, Temperature, Superhigh frequency.

Three final amplifier models were designed, constructed, and tested. Of these models, one was designed to use a gallium arsenide point-contact diode, and the other two were designed to use silicon pill diodes. All three models easily meet the specified performance requirements for room temperature operation. The model using point-contact diode should also provide improved noise performance under refrigerated conditions, but since these diodes are fragile and not yet hermetically sealed, they cannot be relied on for continuous field use. The model using two pill diodes in a balanced circuit configuration proved to be superior in all respects and the field-test models will be based on this unit. (Author)

AD-256 055 Div. 8
(16 May 61) OTS price $6.60.

Radio Corp. of America, Harrison, N. J.
A WIDEBAND, HIGH-GAIN AMPLIFIER TUBE,
by R. W. McMurrough, W. G. Poelstra and others.
Quarterly progress rept. no. 3, 1 Jan-31 Mar 61. 31 Mar 61, 59p. incl. illus. table.
(Contract DA 36-039-sc-85045)
Unclassified report

DESCRIPTORS: *Amplifiers, Broadband, *Microwave amplifiers, Very high frequency, Ultra high frequency, *Preamplifiers, *Electron tubes, Electron beams, Deflection, Electronic circuits, Electron guns, Noise (Radio), Electric fields, Conductivity, Design, Focusing, Sources,

Research continued in the development of a wideband, high-gain deflection amplifier. The interaction between the electron beam and the deflecting signal was shown to be continuous and cumulative. The gain of the amplifier was the result of the interaction of the beam with the forward-wave components of the original deflecting signal and higher-order voltage waves that were induced in the deflection circuit by the to-and-fro movement of the electrons in the modulated beam. The investigation of the Harris-flow-focused experimental deflection amplifier was continued. The gain of the experimental structure was estimated, and its transconductance was calculated. The major sources of noise in the objective deflection amplifier were determined. These included: (1) thermal noise, (2) shot noise, (3) noise due to partition effects at the collector, and (4) noise due to fluctuations in the transverse velocity and position of the electrons in the beam. (Author)

AD-256 068 Div. 8
(17 May 61) OTS price $1.60

Stanford Electronics Labs., Stanford U., Calif.
A SUPERPOSITION PROPERTY OF ANGLE MODULATION,
by J. W. Goodman. 5 May 61. 4p. (Technical rept. no. 710-1)
(Contract AF 33(616)6207)
Unclassified report

DESCRIPTORS: *Modulation, *Phase modulation, *Frequency modulation, Functions, Mathematical analysis, Sidebands.

A superposition property of angle modulation is derived for a class of modulating waveforms. Angle modulation is a highly non-linear operation, with significant sideband energy arising from the interaction of the various modulation components. Thus, the type of linear superposition of sidebands which holds for amplitude modulation does not hold for angle modulation. It is shown that a different type of linear superposition does hold for an important class of angle modulating waveforms, namely those containing at least one periodic component. (Author)

AD-256 082 Div. 8, 26
(19 May 61) OTS price $13.50

RCA Defense Electronic Products, Camden, N. J.
MICRO-MODULE PRODUCTION PROGRAM,
Quarterly rept. no. 11, 1 Oct 60-1 Jan 61. 1 Jan 61, 1v. incl. illus. tables.
(Contract DA 36-039-sc-75968)
Unclassified report

DESCRIPTORS: *Electronic circuits, *Subminiature electronic equipment, Capacitors, Resistors, *Semiconductors, Transistors, Diodes, *Crystals, Materials, Production, Design, Electronic equipment, *Communication equipment, Radio equipment, *Digital computers, Reliability, Circuits, Tests, Life expectancy.

Ceramic trimmer capacitors mounted in r-f modules performed satisfactorily during environmental tests. Designs of inductors using powdered iron cores were prepared for the AN/PRC-51 radio set and a manufacturing specification was written for the processing of such inductors. A survey of transistors and diodes needed for future micro-modules resulted in the selection of three germanium and four of silicon transistor families together with two germanium and three silicon diode families. Changes in fabrication processes were investigated and are being instituted to eliminate failures among the quartz crystal units. A model of the second design of the AN/PRC-34 micro-modular receiver weighs only 6 oz. and has a volume of only 5.5 cuin. A good test performance was given by seven r-f subassemblies constructed with final-grade micro-modules. All flow charts for the MicroPac computer operations were completed and charts of Boolean algebraic equations were prepared and implemented into detailed logical design. Circuits were laid out in the form to be used in micro-modules. Preliminary design work on the power supply was accomplished. (Author)

AD-256 091 Div. 8, 14, 17, 30
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INSTRUMENT FOR MEASUREMENT OF FREQUENCY AND

ACCELERATION OF VIBRATIONS.
by S. D. Rodkevich, I. N. Sokolov, and B. V. Efimov. 8 Nov 60. 10p. (Trans. no. MCL-91 from Izvestiya Vysshykh Uchebnykh Zavedeniy. Priborostroyeniye 3:30-35, 1958)
Unclassified report

DESCRIPTORS: *Vibrations, Frequency, *Frequency meters, Acceleration, Electron tubes, *Frequency analyzers, Electronic equipment, Materials, Test equipment, Impact shock, Mechanical properties, Measurement, Structures, Design, Accelerometers.

An instrument is described for measuring frequencies of 0 to 100 cps, and accelerations of vibrations up to 30 g (gravity); and also the description of an instrument for measuring static accelerations and tilts. The instrument consists of the following basic parts: (1) the acceleration sensing device; (2) the adjusting device for fixing the sensing device on the object; and (3) a measuring part in which the power supply system of the sensing device is concentrated. For recording the acceleration of vibrations in the instrument, the possibility of switching in the MPO-2 loop oscillograph and an electronic oscillograph is provided. The instrument is fed from a network of 127 or 220 volts ac. The entire weight of the instrument is 5 kg. The weight of the sensing device with adjusting device is 160 g (gravity). (Author)

AD-256 099 Div. 8
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
EXPERIMENTAL INVESTIGATION OF THE INTERACTION OF SINGLE WIRE-LINES OF TRANSMISSION (Eksperimental'noye Issledovaniye Vzaimodeystviya Odnoprovodnykh Liniy Peredachi).
8 Nov 60, 13p. incl. illus. (Trans. no. MCL-255 from Radiotekhnika i Elektronika, pp. 592-598, 1959)
Unclassified report

DESCRIPTORS: Technological intelligence, *Transmission lines, Dielectrics, *Antennas, Wire, Coaxial cables, Electromagnetic waves, Propagation, Antenna couplers, Antenna horns, USSR.

The calculative formula for the determination of the magnitude of the period of space beats during the spread of the surface wave along a two-wire system, consisting of two identical wires covered with a layer of dielectric, is deduced. An experimental check of the formula is carried out, and the limits of its applicability are indicated. The construction of the directional coupler for open lines of transmission is introduced. (Author)

AD-256 101 Div. 8
(18 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
REPORTS OF HIGHER SCHOOLS, RADIO ENGINEERING AND ELECTRONICS (SELECTED ARTICLES)
8 Nov 60, 23p. 20 refs. (Trans. no. MCL-266 from Nauchnyye Doklady Vysshey Shkoly, Radiotekhniki i Elektronika, pp. 184-191, 192-198, 1958)
Unclassified report

DESCRIPTORS: *Thermionic emission, USSR, Determination, Semiconductors, *Cathodes, *Oxide cathodes, Mathematical analysis, Electrochemistry, Measurement, Rectifiers, *Cathodes (Electron tubes), *Thyratrons, *Gas discharges, *Electronics, Radio, Technological intelligence.

The possible causes of the disparity between the experimental values of thermionic constant A and its theoretical value are discussed for different types of cathodes. The relation of the work function to temperature, found by the method of shift of characteristic curve and conditioned by the change of level of the electrochemical potential, satisfactorily explains the anomalous values of A in the case of semiconductor cathodes. The method of impulse measurements of the emission of an oxide-coated cathode in gas rectifiers and thyratrons, destined for work under interrupted conditions, is described. The method was checked on industrial thyratrons and on experimental lamps be means of a comparison of the emission of the cathode during the combustion of discharge with its emission in a vacuum. (Author)

AD-256 112 Div. 8, 5
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ELECTRON-BEAM CODING TUBE (Elektronno-Luchevaya Kodiruyushcnaya Trubka)
by Yu. N. Prozorovskiy. 15 Nov 60. 3p. incl. illus. (Trans. no. MCL-440 from Russian Patent no. 116715, pp. 1-2, 10 Dec 57)
Unclassified report

DESCRIPTORS: *Electron beams, Coding, *Beam power tubes, Pulse modulation, Electron tubes, *Communication equipment, USSR, Communication systems, *Radio communication systems, Technological intelligence.

The electron-beam coding tube for communication systems with pulse-code modulation is equipped with a selector electrode with apertures and a directing grid and is characterized by the fact that in order to increase the operating frequency of the tube and to use a sweep frequency of a sinusoidal or other nonlinear form, the apertures in the selector electrode are arranged unevenly, corresponding to the law of the variation of velocity of the trace motion of an electron beam along an electrode. The use in the pulse-code modulation communication system of two coding tubes, switched in alternately at the time of forward motion of the beam and switched out at the time of flyback, is for the purpose of using sweep voltage of a sinusoidal form. (Author)

AD-256 212 Div. 8, 14
(18 May 61) OTS price $3.60

Sprague Electric Co., North Adams, Mass.
DEVELOPMENT OF STABLE CERAMIC CAPACITORS, HI-K, by T. Prokopowicz. Quarterly progress rept. no. 5, 15 Dec 60-15 Mar 61, 15 Mar 61, 1v. incl. illus. tables.
(Contract DA 36-039-sc-78318, Proj. 326-020-0101)
Unclassified report

DESCRIPTORS: *Ceramic capacitors, *Capacitors, Ceramic materials, *Dielectrics, Titanates, Niobates, Magnesium, Iron, Ions, Barium compounds, Dielectric properties, Stability, Temperature, Additives, Porosity, Processing, Manufacturing methods, Life expectancy.

The incorporation of Mg(2+) and Fe(3+) in BaTiO3-

Ba(0.5)NbO3 ceramics is discussed, and the effect of Mg(2+) ions on temperature stability of capacitance is presented. Several ceramic formulations containing Mg(2+) ions yielded dielectric constants near 1800 with a tolerance of + or - 10% in the temperature range -55 to 125 C. Test results for experimental Monolythic models are presented. Shortcomings of these experimental models are discussed, as are future plans for improvement. (Author)

AD-256 213 Div. 8, 25
(18 May 61) OTS price $3.60

New Mexico U. Engineering Experiment Station, Albuquerque.
THE TRANSMISSION OF A PARTICULAR NONUNIFORM PLANE WAVE ACROSS A FLAT BOUNDARY,
by R. H. Williams, Mar 61, 22p. incl. illus.
(Technical rept. no. EE-47)
(Contract Nonr-279801)
Unclassified report

DESCRIPTORS: Electromagnetic waves, *Electromagnetic wave reflections, *Wave transmission, Propagation, Refraction.

The formal solution is presented for the reflected and transmitted electromagnetic fields caused by a particular class of nonuniform plane waves which are incident on a plane boundary separating two infinite half-spaces. The specific class of nonuniform plane waves is characterized by plane waves having planes of constant amplitude parallel to the boundary and planes of constant phase with arbitrary angles of incidence. A specific example is studied in which the medium that contains the incident plane wave is highly conductive and the medium that contains the transmitted field is nonconductive. Almost all the discussion is confined to the transmission coefficients; in particular it is confined to the transmission coefficient for the transverse magnetic case where a phenomenon appears that suggests a pseudo-Brewster angle. It is suggested that this pseudo-Brewster angle can account for some of the properties of the fields in air orginated by a dipole submerged in a conducting medium. (Author)

AD-256 221 Div. 8
(18 May 61) OTS price $3.60

General Electric Co., Schenectady, N. Y.
RESEARCH AND DEVELOPMENT OF SUPERPOWER THYRATRONS,
by A. W. Coolidge. Quarterly progress rept. no. 13 on Phase 2-b, 25 Nov 60-24 Feb 61, 24 Feb 61, 34p. incl. illus.
(Contract DA 36-039-sc-74850)
Unclassified report

DESCRIPTORS: *Thyratrons, *Electron tubes, Anodes, Design, Brazing, Tests, Test equipment.

An analysis of a brazing problem in the anode construction is discussed. Tests were conducted whereby voids in a brazed joint could be detected with an instrument which transmitted and received reflected supersonic waves. A modified anode design is recommended in which the culpable voids could not occur. Tests were performed on a tube having a cavity grid construction. From these tests it was possible to predict approximately the recovery time a tube containing widely spaced virtual and collector anodes. (Author)

AD-256 222 Div. 8, 26
(18 May 61) OTS price $4.60

General Electric Co., Syracuse, N. Y.
PRODUCTION ENGINEERING MEASURE TRANSPARENT PHOSPHOR, HIGH RESOLUTION CATHODE RAY TUBES,
by W. J. Noroski. Quarterly progress rept. no. 2, 1 Sep-30 Nov 60. 30 Nov 60, 43p. incl. illus. tables.
(Contract DA 36-039-sc-85937)
Unclassified report

DESCRIPTORS: *Cathode ray tubes, *Phosphors, Thin films, Production, *Manufacturing methods, Coatings, Vapors, Zinc, Zinc compounds, Silver compounds, Chlorides, Hydrogen compounds, Sulfides, Vapor plating, Cathode ray tube screens, Preparation, Growth.

Continued effort was made to establish a manufacturing capability for the production of transparent phosphor, high resolution cathode ray tubes. The basic process of growing thin film phosphor coatings by vapor reaction techniques is described. The raw materials required for the necessary vapor reactions are zinc metal, zinc chloride, and silver chloride in powder form, and hydrogen sulfide gas. Major work was devoted to the completion of the planned facility and the orderly transfer of operations from the developmental laboratory. (Author)

AD-256 223 Div. 8
(18 May 61) OTS price $3.60

Electron Tube Lab., U. of Michigan, Ann Arbor.
ENERGY MISMATCH AND CUTOFF WAVES IN A TWO-DIMENSIONAL SPACE-CHARGE FLOW,
by Joseph E. Rowe and Richard Y. Lee. Feb 61, 31p. incl. illus. tables (Technical rept. no. 46; Rept. no. 02854-12-T)
(Contract DA 36-039-sc-78260, Proj. 3-99-15-104)
Unclassified report

DESCRIPTORS: Space charges, Electron tubes, Backward wave oscillators, Mathematical analysis, Electrostatics.

A general treatment of the input boundary value problem for two-dimensional space-charge flow is developed using a theorem of electrostatics (Thomson's) which notes that in an electrostatic problem the electric field distribution is such that the electrostatic-field energy is a minimum. This principle is used to determine the average energy density mismatch and the starting conditions for finite thickness beams in M-type backward-wave oscillators. It is shown that the mismatch is greatest for strong space-charge fields, high circuit attenuation, and signal frequencies below the cyclotron frequency. The starting length and beam velocity are greater as calculated by the variational procedure than obtained by the approximate method. Under certain conditions the average energy density mismatch is greater than 20 percent of the electrostatic field energy in the absence of the beam. (Author)

AD-256 228 Div. 8, 25, 26
(18 May 61) OTS price $4.60

General Electric Co., Syracuse, N. Y.
PRODUCTION ENGINEERING MEASURE TRANSPARENT PHOSPHOR. HIGH RESOLUTION CATHODE RAY TUBES.

by W. J. Noroski, Jr. Quarterly progress rept. no. 3, 1 Dec 60-28 Feb 61. 28 Feb 61, 41p. incl. illus. tables.
(Contract DA 36-039-sc-85937)
Unclassified report

DESCRIPTORS: *Cathode ray tubes, *Phosphors, Production, Manufacturing methods, Thin films, Vapor plating, Coatings, Preparation, Zinc, Zinc compounds, Chlorides, Silver compounds, Hydrogen compounds, Sulfides, Cathode ray tube screens.

Primary effort was devoted to the adaptation of the equipment to production techniques and schedules, the manufacture of the preproduction samples, and the evaluation and establishment of proper control parameters. A production rate of approximately two starts per day was maintained. Occasional rates of three or four plates per day were checked out to prove the maximum capability of the facility based on an eight hour working day. Process timers used for turning on equipment before working hours were added to increase this capability. Production results indicated that 57 out of the 97 processed plates were good in all respects. The major loss was due to green spots or heavy metal contamination of the luminescent coating. Most of this is attributed to the contamination of the air space within the facility. (Author)

AD-256 241 Div. 8, 25, 26
(19 May 61) OTS price $8.10

Bliley Electric Co., Erie, Pa.
INDUSTRIAL PREPAREDNESS MEASURE. QUARTZ CRYSTAL UNITS CR-(XM-25)/U,
by J. M. Wolfskill and R. T. Schlaudecker.
Final rept. on Step 1. Feb 61, 85p. incl. illus. table.
(Contract DA 36-039-sc-81270)
Unclassified report

DESCRIPTORS: *Quartz crystals, Very high frequency, *Piezoelectric crystals, *Submarine electronic equipment, *Crystal oscillators, *Manufacturing methods, Processing, Production, Materials, Instruction manuals, Quality control.

The CR-(XM-25)/U crystal units are sub-miniature units in the 125 to 150 mc frequency range. Successful sample units were fabricated from natural quartz and equally successful sample units were made from the cultured quartz. Special lapping machines were used to process the thin, polished crystal plates. Production experiences indicated that only relatively low yields can be achieved primarily because of breakage of the thin, delicate crystal plates. It was concluded that the units in the 140 to 150 mc range should be classified as speciality items, and their production operations conducted in special facilities, such as laboratories, where sufficient individual attention can be devoted to each unit. (Author)

AD-256 243 Div. 8
(19 May 61) OTS price $5.60

Electronics Research Lab., U. of Calif., Berkeley.
SPECIAL DEFLECTION SYSTEMS FOR CATHODE-RAY TUBES,
by D. R. Noel. 2 Dec 60, 51p. incl. illus. tables, 22 refs. (Scientific rept. no. 11)
(Series no. 60, Issue no. 329)
(Contract AF 19(604)2270)
(AFCRL-49) Unclassified report

DESCRIPTORS: *Cathode ray tubes, Electron tubes, Deflection, *Electron beams, Design, *Traveling wave tubes, Distributed amplifiers, Oscilloscopes, Electron guns, Cathode ray tube screens, *Electronic circuits, Tests, Phase distortion, *Deflection coils.

Deflection of an electron beam in a traveling-wave cathode-ray tube can be accomplished in many ways. Of the methods discussed, a modification of the Pierce system is suggested that would enable a progressively larger deflection voltage to be applied to subsequent elements of the deflection system, without producing a non-linear response. An initial investigation into the design requirements of such a system was carried out. A simple method of using a distributed amplifier as part of the deflection circuitry was attempted. Although the output of the distributed amplifier was broadband, the outputs of the individual tubes could not be used because of unfavorable phase relationships. (Author)

AD-256 277 Div. 8, 1, 12
(19 May 61) OTS price $5.60

Rand Corp., Santa Monica, Calif.
STANDARDIZATION OF AUTOMATIC TEST AND CHECKOUT EQUIPMENT: A PRELIMINARY DISCUSSION,
by A. A. Barbour, S. I. Firstman, and M. Kamins.
25 Nov 60, 53p. incl. illus. table (Research memo. no. RM-2685)
(Contract AF 49(638)700)
Unclassified report

DESCRIPTORS: *Electronic equipment, Test equipment, Automatic, Standardization, Economics, Production, Costs, Aircraft, Guided missiles, Reliability, Quality control.

This research memorandum is a guide for evaluating the technical and economic feasibility of standardizing automatic test and checkout equipment. It is intended to be useful alike to Air Force offices charged with reviewing contractors' proposals and to the contractors themselves. Five levels of standardization are defined: component, functional module, functional assembly, tester assembly, and testing system. Two opposing opinions are presented on the desirability and feasibility of standardization. Technical factors relevant to standardizing automatic checkout equipment (ACE) are shown, and each factor is discussed as it relates to feasibility at all levels of standardization. Factors dealing with economic feasibility are also investigated. For example, a weapon-system cost structure is examined to determine where the economic impact of ACE is typically observed, and how much of the system cost is typically affected by test and checkout automation. Within this framework, the potential effects of ACE standardization on weapon-system cost/effectiveness are indicated. In addition, some pertinent points of inquiry concerning the various levels (above the component level) are outlined. (Author)

AD-256 279 Div. 8, 25
(19 May 61) OTS price $1.60

Microwave Lab., Stanford U., Calif.
SOLID-STATE, TWO-LEVEL, HIGH-POWER MASER.
Quarterly progress rept. no. 5, 1 Dec 60-28 Feb 61, on Study of the Feasibility of a

Solid-State, Two-Level, High-Power Microwave Generator. Mar 61, 4p. incl. illus. (ML rept. no. 799)
(Contract DA 36-039-sc-85263, Proj. 3-99-00-000)
Unclassified report

DESCRIPTORS: *Microwave amplifiers, *Microwaves, *Radiofrequency generators, Pulse generators, Magnetic fields, K band, Low pass filters, Ferrites, Dielectrics, *Solid state physics, Design, Tests, Electrical corona.

Theoretical and experimental investigations were continued on pulsed microwave generation without an rf input signal. Initial tests were run on two models of the pulsed generator, using a disk-shaped sample without an rf input signal, without success. Measurements were made on these devices which, it was believed, showed reasons for the negative results. Equations describing the motion of the magnetization in the disk-shaped sample under the influence of a transient magnetic field, whose amplitude and direction changes with time, were programmed on an analog computer. Development of components for a K-band, high-efficiency generator, using an X-band rf input signal, continued. The first model of a low-pass filter for this generator, using a nonlinear dielectric element, was tested. The results were favorable, showing a stop-band without spurious responses. The corona problem on the 100 kilogauss pulse field apparatus also received some attention. (Author)

AD-256 281 Div. 8, 26
(19 May 61) OTS price $5.60

RCA Industrial Tube Products, Lancaster, Pa.
PRODUCTION ENGINEERING MEASURE TUBE TYPE A2582A,
by Ben Sheren. Quarterly rept. no. 2, 1 Oct-31 Dec 60. 31 Dec 60, 61p. incl. illus. tables.
(Contract DA 36-039-sc-85947)
Unclassified report

DESCRIPTORS: *Electron tubes, *Manufacturing methods, Production, *Industrial mobilization, Test equipment, Processing, Design.

For each of the two critical tube element spacing requirements, the final phases of investigation was narrowed to two prospective methods. At this point the prospects of specifying practical procedures are bright. Work on facilities design for the pilot line is half finished. Design of life test equipment was started. A self indexing brazing furnace which is actuated by an automatic pyrometer and will eliminate operator judgement and assure uniform results was studied. Both resistance measurements and Dermitron gauge readings were made on many samples of coated ceramics. The ultimate aim in all studies was a more economical, high quality tube. (Author)

AD-256 327 Div. 8, 6, 12
(22 May 61) OTS price $3.60

Directorate of Research Analysis, Holloman Air Force Base, N. Mex.
ACCURACY LIMITS DUE TO REFRACTION ON ELECTRONIC TRACKING OF SPACE VEHICLES,
by F. W. Hoehndorf. Apr 61. 27p. incl. illus. tables.
(AFOSR-107) Unclassified report

DESCRIPTORS: *Refractive index, Refraction, *Electromagnetic waves, *Microwaves, *Satellite vehicles, High altitude, *Atmospheric refraction, Electronic systems, Tracking, *Radar tracking, Pressure, Temperature, Water vapor, Mathematical analysis, Meteorological data.

The investigation was concerned with the refractive index of electromagnetic microwaves coming from a space vehicle in an environment where this index equals unity. Originally, this effort was planned to be a continuation of an earlier effort to merely give the results of the computations for higher altitudes of the observation sites. However, the results obtained with the primary accepted assumptions for the approximation of the refractive index versus altitude showed them to be physically unrealistic, and therefore some modifications had to be made. These modifications, which do not invalidate the conclusions drawn in the earlier effort, are discussed in some detail. The results of the new computations are given and are compared with a long series of astronomical measurements. (Author)

AD-256 329 Div. 8, 25
(22 May 61) OTS price $8.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
A PHYSICAL OPTICS APPROXIMATION OF THE SCATTERING FOR AXIAL INCIDENCE FROM ROTATIONALLY SYMMETRIC TARGETS,
by David L. Moffat. 15 Feb 61, 91p. incl. illus. 20 refs. (Rept. no 925-6)
(Contract AF 30(602)2042)
Unclassified report

DESCRIPTORS: Scattering, *Radar echo areas, *Radar reflections, *Radar targets, *Spheres, *Conical bodies, *Ogives, Measurement, *Parabolic bodies, Theory, *Cylindrical bodies, Surface properties, *Bodies of revolution, *Aerodynamic configurations, *Electromagnetic wave reflections, Optics, Impedance.

A physical optics approximation to the monostatic and bistatic scattering for axial incidence from rotationally symmetric targets is developed. Both conducting and lossy dielectric bodies, characterized by a surface impedance equal to the intrinsic impedance of the scattering medium, are treated. The resulting general expressions, which are valid within the physical optics approximation for any rotationally symmetric target, are specialized to long, thin, shapes, either finite with sharp apices or semi infinite with a sharp apex, by a modification of the normal physical optics approximation. Theoretical calculations of the axial back scatter from spheres, double cones, parabolic ogives, semi-infinite cones, and semi-infinite cylinders with conical caps for several values of the scatterer surface impedance are presented. Theoretical calculations of the bistatic E plane (plane of the incident E field) cross-section of conducting semi-infinite cones, double cones, and semi-infinite cylinders with conical caps are also given. Where possible, the theoretical results are compared with the exact solution or with representative experimental data to indicate the validity of the theory. (Author)

AD-256 339 Div. 8, 15, 25
(22 May 61) OTS price $2.60

Boston U., Mass.
CORRELATION THEORY OF STATIONARY ELECTROMAGNETIC FIELDS IN THE PRESENCE OF RANDOM SOURCES,
by P. Roman. Mar 61, 19p. (Scientific rept. no. 1)
(Contract AF 19(604)8022)
(AFCRL-132) Unclassified report

DESCRIPTORS: Electromagnetic waves, Plasma physics, *Electromagnetic fields, *Propagation, Correlation techniques, *Statistical functions, Mathematical analysis, Electric currents, Differential equations.

A previously developed (Nuovo Cimento, 12:884, 1954) correlation theory of stationary random electromagnetic fields is extended to the case in which the fields interact with stationary random charges and currents. The basic field equations are deduced and are found to be second order partial differential equations. An analogue to the equation of continuity is derived and some illustrative examples are discussed. Wave equations, which are of the fourth order, are deduced for the electric and magnetic correlation tensors. The theory presented in this paper may have various applications for the theory of plasmas. (Author)

AD-256 390 Div. 8
(22 May 61) OTS price $2.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
THE DESIGN OF ANTENNA ARRAYS FOR MAXIMUM SIGNAL TO NOISE RATIO,
by Jon N. Eberle. Rept. on High-Gain Antenna Realization and Tracking Study. 15 Mar 61. 21p. incl. illus. (Rept. no. 1072-2)
(Contract AF 30(602)2166)
(RADC TN 61-71) Unclassified report

DESCRIPTORS: *Antennas, *Signal-to-noise ratio, Antenna couplers, Attenuation, Transmission lines, *Noise (Radio), Temperature, *Waveguides, Reduction, Preamplifiers, Amplifiers, Design, Tracking, *Parabolic antennas, Reflectors.

Research is concerned with the investigation of the noise level of various antenna arrays. It is intended to show that the performance of an array can be optimized by control of several parameters such as element diameter, number of elements, spacing between elements, and feedline attenuation. It is believed that the array type antenna offers certain advantages over the single aperture antenna when such factors as high power transmission, correction for atmospheric effects are needed, when extremely high gain is needed or where bandwidth control is desired. (Author)

AD-256 413 Div. 8
(22 May 61) OTS price $1.60

David Sarnoff Research Center, Princeton, N. J.
MOLECULAR AMPLIFIERS AND GENERATORS,
by H. J. Gerritsen. Quarterly rept. no. 2, 1 Dec 60-28 Feb 61. 7 Mar 61, 14p. incl. illus.
(Contract DA 36-039-sc-87386)
Unclassified report

DESCRIPTORS: Microwaves, *Microwave amplifiers, Amplifiers, *Radiofrequency generators, Waveguides, Chromium, Titanium compounds, Dioxides, Relaxation time, Lattices, Design, Tantalum, Nickel, Microwave oscillators, Materials, Dielectric properties, Broadband, *Paramagnetic crystals, Ruby, Ions, Atomic spectrum, Paramagnetic resonance, Titanium, Magnetic fields, Measurement.

The usefulness of chromium-doped rutile as a maser material was demonstrated in the successful operation of an experimental traveling wave maser consisting only of a waveguide filled with active material. The tunable bandwidth of the maser is from 8 kmc up to 24 kmc. The relaxation time of Ti 3+ in rutile was measured to be only 0.1 msec., but the crystal is lossy. Ni 3+ spectra were studied in rutile. (Author)

AD-256 419 Div. 8
(22 May 61) OTS price $4.60

Electronic Defense Labs., Mountain View, Calif.
TWT PHASE SHIFT CHARACTERISTICS,
by Richard D. Kelch and Harry E. Davidson. 10 Feb 61, 35p. incl. illus. tables, 11 refs.
(Technical memo. no. EDL-M352)
(Contract DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: *Traveling wave tubes, Electron tubes, *Microwave amplifiers, *Phase shifters, Phase measurement, Amplifiers, Measurement, Tests, Test methods, Errors, Helixes, Phase modulation.

Several factors that determine phase shift through a traveling-wave tube amplifier are reviewed briefly. A common method of measuring the relative phase shift through a device is presented in detail, including a discussion of the sources and magnitude of measurement errors encountered. Phase-shift characteristics were measured on several TWT's. The data obtained from two of the tubes are compared to the qualitative predictions of theory. (Author)

AD-256 421 Div. 8
(22 May 61) OTS price $6.60

Sylvania Electric Products, Inc., Waltham, Mass.
MULTIWAVE TRANSMISSION LINE AND SEMICONDUCTOR SWITCHING ELEMENTS STUDIES,
by James D. Kellett. Final rept. 28 Feb 61, 43p. incl. illus. tables, 22 refs. (Rept. no. F424-1)
(Contract AF 19(604)5474)
(AFCRL-141) Unclassified report

DESCRIPTORS: *Transmission lines, Crystals, *Semiconductors, *Switching circuits, Radar antennas, Electronic switches, *Microwave equipment, Electrical properties, Design, *Waveguides, Attenuation, Diodes.

Results are presented of a program to investigate (1) the application of crystal switches to the scanning of receiving antennas and (2) the properties of a multiwave transmission line. The crystal switch study was concerned with the characteristics of single and multithrow switches which would determine their effectiveness as an antenna scanning device. Measurements on insertion loss, switching ratio, switching speed and noise figure were made. The results proved the feasibility of using these devices for high speed scanning and indicated some improvements to increase their bandwidth properties. The multiwave transmission line study was concerned with a transmission line consisting of two unbalanced TEM lines whose outer form was a rectangular or ridged waveguide. Major points of investigation were the attenuation of TEM modes, the cross coupling of the TEM modes, the effect of center conductors on the cut-off frequency of the dominant waveguide mode, and the construction of an experimental mode launcher. The results of the study indicated that this system can simultaneously transmit two TEM modes and the dominant waveguide mode with negligible cross coupling. (Author)

AD-256 453 Div. 8
(24 May 61) OTS price $2.60

Aero Geo Astro Corp., Alexandria, Va.
INVESTIGATIONS OF FLUSH-MOUNTED ANTENNAS,
by K. S. Kelleher and D. M. Bowie. Quarterly technical note no. 1. 28 Apr 61, 23p. incl. illus. 16 refs.
(Contract AF 30(602)2386)
(RADC TN 61-74) Unclassified report

DESCRIPTORS: *Slot antennas, Antennas, Microwave equipment, *Radar antennas, Phase measurement, Diffraction, Dielectrics, *Waveguides, Measurement, *Transmission lines, Electromagnetic waves, Attenuation, Propagation, Mathematical analysis, Surfaces, Helixes, Diffraction gratings.

The objective of this investigation is to develop microwave, surface-wave antenna structures and to investigate time-measuring techniques employing these structures. The three major areas which were investigated are: (1) techniques for measuring surface waves, (2) helical surface-wave structures, and (3) diffraction obstacles mounted on a ground plane. Wave characteristics which were measured are phase velocity and attenuation of the wave carried on the transmission line. Some work was done on the helical waveguide, however, this investigation was dropped. An investigation of diffraction obstacles, represented by corrugated surfaces and edge diffraction, was begun. (Author)

AD-256 470 Div. 8, 6
(23 May 61) OTS price $8.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
ANTENNA LABORATORY PUBLICATIONS, 1947 TO FEBRUARY 1961,
ed. by W. A. Greene. 1961. 1v.
Unclassified report

DESCRIPTORS: *Antennas, *Bibliography, Indexes, *Airplane antennas, *Antenna radiation patterns, *Astronautics, *Electronic circuits, *Electromagnetic waves, *Dielectrics, Impedance, Instrumentation, Military equipment, Modulation, Polarization, *Radar antennas, *Radar echo areas, *Radomes, Reflectors, *Servomechanisms, *Waveguides, *Transmission lines.

A compilation is presented to act as a ready reference to the publications produced by the Antenna Laboratory. Author and subject indexing is included to provide rapid determination of reports falling within different areas of interest. Reports are listed which fall into the general areas of: absorbers; aircraft antennas; aircraft echo characteristics; antenna patterns; antenna theory; antenna types; astronautics and avionics; circuit theory; dielectric; echo area; echo measurements; electrical and electronic systems; EM waves and fields; frequencies; impedance; instrumentation equipment, measurement, and recording; lenses; mathematics; military equipment; models; modulation; molectronics; parametric devices; patterns; polarization; radar; radomes; reflectors; servomechanisms and computors; waveguides; and transmission lines.

AD-256 477 Div. 8, 4, 25
(23 May 61) OTS price $4.60

Columbia Radiation Lab., New York.
RESEARCH INVESTIGATION DIRECTED TOWARD EXTENDING THE USEFUL RANGE OF THE ELECTROMAGNETIC SPECTRUM,
by R. Novick. Quarterly progress rept. no. 5, 16 Dec 60-15 Mar 61. 15 Mar 61, 43p. incl. illus. tables (Rept. no. CU-3-61-SC-78330)
(Contract DA 36-039-sc-78330)
Unclassified report

DESCRIPTORS: *Radio astronomy, *Magnetrons, *Microwave amplifiers, *Microwave spectroscopy, Hyperfine structure, Microwave equipment, Krypton, Cadmium, Free radicals, Cesium, Dielectrics, Magnetism, Relaxation time, Infrared equipment, Crystals.

Radioastronomical measurements are in progress using the 10-cm maser amplifier. Further progress is described on the M-band radioastronomy system. Work on the cesium infrared maser and several experiments using a pulsed ruby optical maser are described. A theoretical treatment for dielectric microwave resonators is outlined, along with experimental confirmation. Measurements are described on dielectric materials of radioastronomical interest, on the OH free radical spectrum, and on several paramagnetic relaxation experiments. Beam maser spectroscopy and the two cavity maser are described. Population inversion has been achieved in the 55 kMc maser experiment. Several atomic hyperfine measurements, including precise experimental results for Kr-83 are given. Work on the molecular beam-surface interaction experiment is continuing. Values for the spin magnetic moment and quadrupole moment of Cd-109 are reported. (Author)

AD-256 478 Div. 8, 25
(22 May 61) OTS price $2.60

Diamond Ordnance Fuze Labs., Washington, D. C.
DEPENDENCE OF Z-PARAMETERS ON THE LF TRANSISTOR T-EQUIVALENT CIRCUIT,
by Nicholas Kyriakopoulos. 5 Apr 61, 27p. incl. illus. table. (DOFL rept. no. TR-934)
(Proj. 90295)
Unclassified report

DESCRIPTORS: *Transistors, *Circuits, Low frequency, Impedance, Simulation, Theory, Digital computers, Mathematical analysis.

The Z-parameters of a transistor have been calculated in terms of the transistor T-equivalent circuit parameters. The calculations have been made for a frequency of 1.0 kc. In addition, each of the independent equivalent circuit parameters was halved and doubled while the rest were held constant, and the effect on the Z-parameters investigated. The results indicate that in the common base and common emitter configurations the input impedance depends on r sub b only, while the forward transfer impedance depends on r sub b and r sub e. The rest of the parameters are functions of r sub e and C sub e only. (Author)

AD-256 491 Div. 8, 2, 5, 6, 30
(23 May 61) OTS price $8.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DIVISION 3. RADIO PHYSICS.
Quarterly progress rept. for period ending 15 Jan 61. 2 May 61, 88p. incl. illus. tables.
(Contract AF 19(604)7400)
(AFCCDD TN 61-1003) Unclassified report

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

DESCRIPTORS: Radio waves, Propagation, *Ionospheric propagation, *Radio transmission, Radar equipment, Radio equipment, *Microwave equipment, *Radio communication systems, Data transmission systems, Scattering, Radar antennas, Interferometers, *Antennas, *Data processing systems, Communications theory, Radio astronomy.

Contents:
Radio propagation: Radio propagation factors related to SST systems; Radio transmission research
Communication techniques: Project West Ford propagation experiment; Communication and detection theory
Communication systems: Orbital scattering communication systems (Project West Ford); Data transmission studies; Advanced development and theoretical studies
Surveillance techniques: Programs and results; Facilities
Antennas: El Campo VHF antenna; Project West Ford antenna and microwave component system; Haystack Hill antenna system; Near-field phase variation
Data processing: Statistical properties of DICON channel receiver; Communications data-processing program; DICON teletype

AD-256 539 Div. 8, 12
(24 May 61) OTS price $2.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
THE NON-RELATIVISTIC DOPPLER SHIFT IN THE IONOSPHERE,
by P. R. Arendt. Feb 61, 24p. (ASRDL Technical rept. no. 2190)
Unclassified report

DESCRIPTORS: *Radio astronomy, *Ionosphere, *Doppler systems, Frequency shift, Density, Ionospheric propagation, Refractive index, Radio waves, Satellite vehicles, Equations, *Communications theory, Mathematical analysis, Differential equations, Theory, Electrons.

A quasi-differential equation is deduced for the doppler shift generated at a satellite moving through or beyond the ionosphere. The general relationship is obtained as the time derivative of the optical length of the curved radio path. This differentiation is achieved as the sum of two partial differentiations: one for a static or frozen ionosphere, the other for a static position of the satellite. Both of these are performed with the use of the wavefront concept and the reciprocity theorem. The final equation describes the instantaneous doppler shift in an isotropic non-static medium as a normal doppler shift in a static or frozen ionosphere augmented by two correction terms that represent the momentary fluctuations of the path length and the integrated momentary fluctuations of the electron density along the path (frequency scintillations). Another method is described that uses the differentiation under the integral (this method was used in the early literature on satellites). The precise interpretation of this earlier method is given, and is applied to the center cone of an overhead passage in a horizontally stratified static medium. (Author)

AD-256 540 Div. 8, 12
(24 May 61) OTS price $2.60

Friez Instrument Div., Bendix Aviation Corp., Baltimore, Md.
DESIGN, DEVELOPMENT AND FABRICATION OF BAROSWITCH, REMOTE XM-10; BAROSWITCH, PRESET XM-11; AND CONTROL, BAROSWITCH SETTING: XT-4126,
by W. J. Hughes. Progress rept. no. 13, 1 Jan-28 Feb 61. 3 Mar 61, 24p. incl. tables.
(Contract DA 36-034-ORD-2890, Proj. TN2-8109)
Unclassified report

DESCRIPTORS: *Pressure switches, Design, Tests, Vibration, Production, *Guided missiles, Barometric pressure, Altimeters.

Continued research is presented on the XM-11 baroswitch. It was felt that the problem of vibration isolation in the switch was nearly resolved. The investigation of the setting curve characteristics is near completion. Hinge material for the XM-11 device was changed to type 303 stainless steel to make compensation easier and to reduce the temperature error to less than 5 mbs over the range. Results indicated stability of the XM-11 when placed on drift test. The baro set lamp operating voltages were established and incorporated into setters. All of the panel and case details were defined for the XT-4126A. (Author)

AD-256 544 Div. 8, 5
(24 May 61) OTS price $13.00

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
MANUSCRIPT OF CATALOGUE, VOLUME 1A. TESTS AND TEST PROCEDURES, PROJECT A-343. ELECTRONIC EQUIPMENT INTERFERENCE CHARACTERISTICS-COMMUNICATION TYPE,
by C. E. Blakely, R. N. Bailey and others.
20 Dec 60. 180p. incl. illus. tables, 42 refs.
(Contract DA 36-039-sc-74855)
Unclassified report

DESCRIPTORS: *Electronic equipment, *Radio communication systems, *Radio interference, Radio interference analyzers, Directories, Catalogs, Communication equipment, Interference, Radio transmitters, Radio receivers, Antennas, Measurement, Sidebands, Frequency modulation, Amplitude modulation, Modulation, Tests, Test equipment, Army, Navigation, Radiofrequency, Test methods, Analysis.

This volume presents tests and procedures for use in interpreting the data published in other volumes of this series. The principal differences between this volume and volume 1 (AD-236 216) are the addition of test procedures for navigational receivers, SSB receivers, SSB transmitters and an expanded list of definitions. Major changes were also made in some of the AM and FM tests to simplify and clarify the procedures. The tests contained in this volume were chosen and instrumented with the purpose of obtaining as much data concerning the spectrum signature characteristics of communications equipment as possible without obtaining large amounts of irrelevant data. This volume should always be referred to for explanation of symbols, definitions of terms, and terminology.

AD-256 545 Div. 8, 5
(24 May 61) OTS price $9.10

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
MANUSCRIPT OF CATALOGUE, VOLUME 2, DATA REDUCTION OF MUTUAL INTERFERENCE MATRICES, PROJECT A-343.

DIRECTORY OF ELECTRONIC EQUIPMENT CHARACTERISTICS, NON-RADAR TYPES,
by I. E. Perlin and C. E. Blakely. 21 Sep 59. 100p. incl. illus. tables.
(Contract DA 36-039-sc-74855)
Unclassified report

DESCRIPTORS: *Electronic equipment, *Radio communication systems, *Radio interference, Radio interference analyzers, Directories, Communication equipment, Mathematical prediction, Interference, Equations, Matrix algebra, Radio transmitters, Radio receivers, Radiofrequency, Tests, Test equipment, Army, Mathematical computer data, Analysis, Catalogs.

In predicting interference one is concerned with the calculation of the frequencies where interference will occur and the magnitude of the resulting interference. A device which was used to show this pictorially is the mutual interference chart or mutual interference matrix. It is usually referred to as a chart when in pictorial form and as a matrix when in digital form. The processing of a mutual interference matrix for sets of non-interfering frequencies is separated into two cases. The first case is concerned with symmetric mutual interference matrices with no distinction between the transmitter or receiver frequencies. The second case is applicable to a general mutual interference matrix with the distinction between transmitter and receiver frequencies preserved. Both cases are presented. (Author)

AD-256 554 Div. 8
(24 May 61) OTS price $2.60

Radiation Lab., Johns Hopkins U., Baltimore, Md.
THE CUT-OFF WAVELENGTHS AND POWER-VOLTAGE IMPEDANCES OF COMPOSITE WAVEGUIDES FOR THE FUNDAMENTAL MODE,
by G. R. Valenzuela. May 61, 16p. incl. illus.
(Technical rept. no. AF-87)
(Contract AF 33(616)6753)
Unclassified report

DESCRIPTORS: *Waveguides, Waveguide bends, *Electromagnetic waves, Propagation, Impedance, Numerical analysis, *Microwave networks, Mathematical analysis, Integral equations.

The Rayleigh-Ritz method is used to solve the eigenvalue problem for electromagnetic waves propagating through a waveguide of a non-simple cross section. The method is applied to obtain the cut-off wavelength and the power-voltage impedance for the fundamental mode (that equivalent to the H10 mode in rectangular waveguide and the H11 mode in circular waveguide for a waveguide with semicircular side walls and flat top and bottom walls, and for a truncated-circular waveguide. Numerical results are given for both waveguides, and supporting experimental evidence is adduced for the waveguide with semicircular sides and flat top and bottom walls, for aspect ratios of 0.302 and 0.702. The cut-off wavelengths obtained are within 3% while the power-voltage impedances are within 6% of their respective exact values. (Author)

AD-256 557 Div. 8, 26
(24 May 61) OTS price $3.60

Transitron Electronic Corp., Wakefield, Mass.
PRODUCTION ENGINEERING MEASURE ON SILICON HIGH FREQUENCY POWER TRANSISTOR,
by Pieter H. de Beurs. Quarterly rept. 1 Jan-31 Mar 61, 31 Mar 61. 24p. incl. illus. tables.
(Contract DA 36-039-sc-81286)
Unclassified report

DESCRIPTORS: Silicon, *Transistors, High frequency, *Manufacturing methods, Production, Processing, Quality control, *Radiofrequency power amplifiers, Test equipment, Tests, Diodes, Temperature, Soldering, Design, Electrical properties.

The group A collector to emitter cutoff current and the collector to base leakage current of 200 engineering samples are reviewed. Based on these data, modifications in processing prior to the base diffusion are presented. Data are given on a group of engineering samples made with the revised process. Results of ICO and ICES testing after 1000 hours at 200 C are given. A circuit for the measurement of the thermal resistance is described. Data are given for different solders and soldering techniques. (Author)

AD-256 565 Div. 8, 4, 14, 17, 25, 30
(23 May 61) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
A.I.D. PRESS NO. 460.
22 May 61, 4p. incl. illus.
Unclassified report

DESCRIPTORS: *Tuning devices, Materials, Test equipment, *Test sets, East Germany, *Oscillators, *Paramagnetic resonance, Design, Czechoslovakia, Paramagnetic crystals, *Corundum, Titanium, Viscosimeters, Welds, Corrosion inhibition, Aluminum alloys, Heat treatment, Corrosion, Aluminum compounds, *Electroplating, Cobalt, Oxides, Resins, Relaxation time, *Polymers, Vinyl radicals, Phosphonyl radicals, Chlorides, Magnesium, *Nitrile rubber, Aging, USSR.

Contents:
High-frequency automatic measuring line (USSR)
Device for testing of materials (East Germany)
New oscillator (Czechoslovakia)
Paramagnetic resonance of Ti and Co ions in corundum crystals (USSR)
Polymers and copolymers of vinylphosphonyl chloride (USSR)
Phosphonitrile chloride rubber (USSR)
Magnesium anodizing (USSR)
Effect of heat treatment on corrosion behavior of AMr6 aluminum alloy and welds (USSR)
Continuous action viscosimeter (USSR)

AD-256 568 Div. 8, 26
(24 May 61) OTS price $2.60

Western Electric Co., Laureldale, Pa.
INDUSTRIAL PREPAREDNESS STUDY. RUGGEDIZED AUDIO TRANSISTORS,
by G. T. DeNoss and L. D. Emery, Jr. Quarterly progress rept. no. 11, 1 Dec 60-28 Feb 61. 28 Feb 61, 19p. incl. illus.
(Contract DA 36-039-sc-81252)
Unclassified report

DESCRIPTORS: *Transistors, Production, *Manufacturing methods, Electrical properties, Audio amplifiers, Design, Reliability, Tests.

Effort was devoted to the resolution of difficulties encountered in manufacturing the 2N668 ruggedized audio transistor. It was discovered that contamination had been building up in the alloying furnaces, causing injecting base contacts. Elimination of this condition greatly improved electrical results at final testing. Increased rinsing after etching and improvements in the method of post-etch electrical testing produced improved results with less etching required. While the experiments have proved fruitful, the necessary devices to complete the pilot run have not yet been completely fabricated. (Author)

AD-256 569 Div. 8, 26
(24 May 61) OTS price $8.10

Western Electric Co., Laureldale, Pa.
PRODUCTION ENGINEERING MEASURE. MECHANIZATION OF SEMICONDUCTOR DEVICES 2N560, 2N1051, 2N1195, 1N664, 1N665, 1N666, 1N667, 1N668, 1N669, 1N673, 1N675, 1N697, AND 1N701,
by B. W. Shugars. Quarterly progress rept. no. 7, 26 Dec 60-26 Mar 61. 26 Mar 61, 79p. incl. illus.
(Contract DA 36-039-sc-81294)
Unclassified report

DESCRIPTORS: *Semiconductors, *Transistors, *Diodes, *Manufacturing methods, Production, *Machines, Design, Test equipment.

Development work continued on mechanization of the 2N560, 2N1051 and 2N1195 transistors as well as the family of 1/4 watt diodes. The development work on the transistors covered three distinct areas of mechanization: (1) wafer preparation, (2) piece part fabrication, and (3) device assembly. The progress of each operation is reported. Progress is also reported on the development of diode mechanized equipment. (Author)

AD-256 570 Div. 8, 26
(24 May 61) OTS price $5.60

Western Electric Co., Laureldale, Pa.
PRODUCTION ENGINEERING MEASURES. DIFFUSED-SEMICONDUCTOR DEVICES 7, 12 PLUS 2N559 AND 2N1094,
by B. W. Shugars. Quarterly progress rept. no. 14, 10 Dec 60-10 Mar 61. 10 Mar 61, 49p. incl. illus.
(Contract DA 36-039-sc-72729)
Unclassified report

DESCRIPTORS: *Semiconductors, *Transistors, Germanium, *Manufacturing methods, Production, Bonding, Machines, Plating, Test equipment, Packaging, Cleaning, Gold wire, Tests.

Continued research is reported on production engineering measures for diffused semiconductor devices. Pilot production of device 12 on an experimental basis was completed with satisfactory resolution of the material problem. The pilot run was initiated when acceptance of preproduction samples was received. In analyzing the data it was found that two factors which contributed most to yield increases were improved operator performance and refinement of machine adjustment. In the mechanization program for devices 2N559 and 2N1094, one additional machine was placed in production, thus bringing to five the number of machines completed. In addition, eight machines are in various stages of prove-in. (Author)

AD-256 586 Div. 8, 26
(25 May 61) OTS price $1.10

General Dynamics/Electronics, San Diego, Calif.
APPLICATION OF NEW MATERIALS AND TECHNIQUES IN ELECTRON GUN FABRICATION.
Interim development rept., 1 Jan-31 Mar 61. 18 Apr 61, 9p. incl. illus.
(Contract NObsr-81208)
Unclassified report

DESCRIPTORS: *Electron guns, Electron tubes, *Manufacturing methods, *Cathode ray tubes, Production, Molding, Design, Tests.

A 5AQP7 tube with a molded split-cylinder type gun was completed. It operated very satisfactorily, and compared favorably to conventional tubes. Although the feasibility of molded electron guns was adequately demonstrated, many refinements are still possible. The gun design for the complete cylinder gun was practically completed and requires only minor adjustments. Since these adjustments can be made in the molded part, it was possible to complete the required drawings and requisition the mold. (Author)

AD-256 589 Div. 8
(25 May 61) OTS price $1.60

Hughes Research Labs., Malibu, Calif.
RESEARCH AND DEVELOPMENT OF TWO-COLOR TUBES.
Interim engineering rept. no. 4, 31 Dec 60-30 Apr 61. 30 Apr 61, 13p. incl. illus. table.
(Contract NObsr-81199)
Unclassified report

DESCRIPTORS: Electron tubes, *Storage tubes, Colors, Electron guns, Fluorescent screens, Luminescence, Phosphors, Design, Tests.

Research was continued on the development of a two-color storage tube having a single axial writing gun and a flat-faced screen. The second sealed-off tube was tested and the third completed and tested. The performance of the third tube was substantially improved over that of the two previous tubes. The uniformity of color-shift over the target area was considerably better, and the color range over the usable area was substantially greater. The design change responsible for this improvement was the incorporation of an electroformed nickel storage mask in place of the former stainless steel etched storage mask. The performance data relating to the second and third sealed-off tubes are presented. (Author)

AD-256 611 Div. 8, 25
(26 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE THERMOELECTRIC COOLING OF PHOTOMULTIPLIERS (Termoelektricheskoye Okhlazhdeniye Fotoumnozhiteley),
by Ye. A. Kolenko, Kh. V. Protopopov and others. 18 Oct 60, 4p. (Trans. no. MCL-353 from Pribory I Tekhnika Eksperimenta pp. 140-142, 1959)
Unclassified report

DESCRIPTORS: Technological intelligence, *Semiconductors, *Photomultipliers, Design, *Cooling, Thermionic emission, Temperature, Thermal insulation, Servomechanisms, USSR.

Semiconductor devices for cooling photomultipliers are described. Results are presented of testing a detector with semiconductor cooling in a photomultiplier of the FEU-11 type. The amplitude of noise is reduced 2.5 times when the temperature falls from 24 to -5 C. (Author)

AD-256 615 Div. 8, 5
(26 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SLOTTED PARASITES DEFLECTOR FOR DIPOLE FEED,
by Calvin C. Jones. 7 Nov 60, 6p. (Trans. no. NCL-734 from Italian application no. 647, 457, Patent no. 409116, pp. 4, 1947)
Unclassified report

DESCRIPTORS: Technological intelligence, Cavity resonators, Ultra high frequency, Microwaves, *Radio transmission, *Radio stations, *Slot antennas, Dipole antennas, Italy.

A patent application is discussed pertaining to an Antenna Disposition for a Radio Station from Which Two Independent Connections Depart in One Direction, Particularly for an Auxiliary Station Operating on Decimetric Waves. (Author)

AD-256 632 Div. 8
(26 May 61) OTS price $1.60

Electronics Research Lab., U. of Calif., Berkeley.
A GENERAL ANALYSIS OF OPTICAL, INFRARED, AND MICROWAVE MASER OSCILLATOR EMISSION,
by J. R. Singer and S. Wang. 21 Mar 61, 8p.
(Series no. 60, Issue no. 352)
(Contract AF 49(638)102)
(AFOSR-388) Unclassified report

DESCRIPTORS: *Microwave amplifiers, Optical equipment, *Microwave oscillators, *Infrared equipment, *Microwave equipment, Amplifiers, Oscillators, Mathematical analysis, *Amplitude modulation, Quantum mechanics, *Dipole moments.

The equations are generalized governing coherent emission from quantum mechanical amplifiers (microwave, infrared, and optical masers) using either electric or magnetic dipole transitions. Earlier analyses by Gordon, Zeiger and Townes, Feynman, Vernon and Hellworth, and Wang and Singer, are incorporated in this generalization. The principal new result of this analysis is that an amplitude modulation of the output is to be expected from all maser oscillators excepting those in which excited atoms are supplied at a notably greater rate than the depopulation rate due to coherent induced emission. This analysis also suggests that an energy population inversion of electric dipole moments can be performed using coherent light sources in the same manner as with magnetic dipole moments. It appears therefore that modulation of an optical or infrared maser (e.g., for communication purposes) may be easily accomplished by varying the population of excited states through control of the pumping energy. This modulation may be both by absorption and amplification. (Author)

AD-256 653 Div. 8
(26 May 61) OTS price $2.60

Electron Tube Lab., U. of Michigan, Ann Arbor.
N-BEAM NONLINEAR TRAVELING-WAVE AMPLIFIER ANALYSIS,
by Joseph E. Rowe. Jan 61, 21p. incl. illus. table (Technical rept. no. 44) (Rept. no. 03736-5-T)
(Contract AF 30(602)2303, Proj. 5573)
(RADC TN 61-75) Unclassified report

DESCRIPTORS: *Traveling wave tubes, *Space charges, *Amplifiers, Electron tubes, Electrons, Electric fields, *Microwave amplifiers, Theory, Mathematical analysis, Analysis of variance, Circuits, *Electron wave tubes.

An approximate method was used to study the effect of transverse electric field variations on the gain and efficiency of large-signal travel-wave amplifiers. The annular electron stream is subdivided into a number of annular rings each containing and equal fraction of the total current. It is assumed that the circuit field varies over the stream cross section and that each segment has a different coupling to the circuit. The space-charge field is assumed independent of radius. The effect on gain and efficiency is calculated for a stream diameter of B equals 1 and it is found that a subdivision of the stream into 2 segments with different couplings to the circuit gives a lower saturation efficiency but that further subdivision does not appreciably change the results. (Author)

AD-256 668 Div. 8, 25
(26 May 61) OTS price $6.60

Stanford Electronics Labs., Stanford U., Calif.
SOLID-STATE ELECTRONICS RESEARCH.
Consolidated quarterly status rept. no. 10, 1 Jan-31 Mar 61. 31 Mar 61, 60p. incl. illus. table.
(Contracts Nonr-22531, Nonr-22524, DA 36-039-sc-85339, DA 36-039-sc-73178, DA 36-039-sc-85387, DA 36-039-sc-78296, AF 33(616)6207, AF 33(616)7726, and AF 49(638)660)
Unclassified report

DESCRIPTORS: Electronics, *Scientific research, *Electronic equipment, Electron tubes, Semiconductors, Materials, Solids, *Electronic circuits, *Microwave amplifiers, *Microwave oscillators, *Transistors, Switching circuits.

Contents: Neuristor studies; Models of thermoelectric devices; Reliable microsystems; Neuristor realization; Photoconductivity-electroluminescence studies; Improvement of reliability by redundancy and adaption; Adaptive switching circuits; Networks of adaptive memistor neurons; Memistor research; Studies in multi-layer networks of adaptive neurons; Switching type regulators; Variable delay lines for phase modulation; A study of nonlinear distortion of transistors; A study of field-effect switching devices; Studies of breakdown in silicon; Study of hot electrons in silicon; Silicon oxide capacitors; Neuristor device study; Hot electrons in germanium; Epitaxial techniques; Surface field-effect amplifiers; Thin-film silicon-carbide devices; Solid-state microwave amplifying and generating devices; Large-signal analysis of nonlinear trans-

mission lines; Properties of small contacts to semiconductors; Electron and phonon behavior in solids; High-speed high-current switching devices; Parametric circuits; Diffusion of impurities in III-V compound semiconductors; Adaptive elements; Studies on broadband, solid-state, and optical masers; Parametric amplifiers; and Ferrimagnetic filters and resonators.

AD-256 672 Div. 8
(26 May 61) OTS price $4.60

Stanford Research Inst., Menlo Park, Calif.
RADIATION FROM VARIABLE-REACTANCE SURFACE-WAVE ANTENNAS,
by M. G. Andreasen. Mar 61, 43p. incl. illus. 28 refs. (Scientific rept. no. 12)
(Contract AF 19(604)3502)
(AFCRL-199) Unclassified report

DESCRIPTORS: Theory, *Antennas, *Slot antennas, *Antenna radiation patterns, Measurement, Microwave equipment, Design, Mathematical analysis.

A theoretical study is presented of the properties of flush-mounted or two-sided variable-reactance surface-wave antennas. The paradox of radiation from a constant-reactance surface-wave antenna is discussed also in order to derive an understanding of the principle of radiation from a surface-wave antenna with periodically varying parameters. The principle of radiation from Simon's cigar antenna which has caused some controversy, is discussed. Finally, a theory, which is in principle exact, is developed for a variable-reactance surface-wave antenna. By this theory, the surface field can be determined using a field representation in terms of couples cylindrical modes. For practical designs approximate expressions for the surface field are derived. (Author)

AD-256 675 Div. 8, 5
(26 May 61) OTS price $4.60

Washington U., Seattle. Coll. of Engineering.
INFORMATION TRANSMISSION IN RF SYSTEMS WITH MULTI-PATH PROPAGATION,
by David D. McNelis and H. Myron Swarm. Dec 60, 42p. incl. illus. (Technical rept. no. 49)
(Contract AF 19(604)4098)
(AFCRL TN 60-1182) Unclassified report

DESCRIPTORS: *Data transmission systems, Propagation, *Multipath transmission, *Radio signals, Attenuation, *Antennas, Antenna radiation patterns, *Communications theory, Signal-to-noise ratio, Mathematical analysis, Electromagnetic waves, Radio transmission, Statistical analysis, Statistical functions.

Multi-path propagation is considered as a function of the differences in propagation times for the several paths. The percent of time that a transmitted signal of constant amplitude will exceed a threshold level is determined for systems with small propagation-time differences. The effect of the antenna pattern on this statistic is considered. In addition, the envelope auto-correlation function for the received signal is determined as a function of the phase stability of the various signals making up the received signal. For systems having large but fixed propagation-time differences between the received components, and with thermal noise at the receiver, the information capacities of the systems are determined to lie within certain limits. A means for attaining the upper limit is determined. Numerical results are obtained for systems where there are only two propagation paths. (Author)

AD-256 691 Div. 8
(29 May 61) OTS price $4.60

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
STUDIES OF CONTINUOUSLY OPERATED CATHODES,
by N. Erdibil. Technical rept. no. 6 on Linear Beam Microwave Tubes. 15 Aug 60, 41p. 13 refs. (Research rept. no. EE-469)
(Contract AF 30(602)1696)
(RADC TN 61-80) Unclassified report

DESCRIPTORS: *Electron tubes, *Cathodes (Electron tubes), Gases, Manufacturing methods, Thorium, Tungsten, Test equipment, Temperature, *Thermionic emission, Noise (Radio), Spectrographic analysis, Tests, Vacuum systems, Measurement, Processing, Monoxides, Carbon compounds, Carbon dioxide, Hydrogen, Oxygen.

Gas evolution in a thorium-tungsten cathode of an L-cathode during processing and operating periods was investigated. Temperature-independent components of the work function for the cathodes were found from the emission. Emission levels were obtained by the application of the shot-noise reduction factor measurement technique. Effects of CO, CO2, H, and O on the emission activity of the cathodes was studied. Also, an attempt was made to explain the physical nature of oxygen poisoning. (Author)

AD-256 692 Div. 8, 15, 25
(29 May 61) OTS price $4.60

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
THE MEASUREMENT OF CATHODE ELECTRON TEMPERATURE UTILIZING AN A-C RETARDING POTENTIAL DEVICE,
by A. D. Wilson. Technical rept. no. 58 on Electronics Research. 15 Nov 60, 38p. incl. illus.
(Research rept. no. EE-480)
(Contract DA 36-039-sc-85272)
Unclassified report

DESCRIPTORS: *Electron tubes, *Cathodes (Electron tubes), Temperature, Measurement, *Electrons, Density, Mathematical analysis, Instrumentation, *Thermometers, Integral equations, Thermal expansion, Tests.

An a-c retarding potential technique for measurement of the cathode temperature is developed. The theory of the measurement, which assumes a Maxwellian distribution of the exit velocities of the emitted electrons is discussed. Procedure of measurement, interpretation of typical results, and limitations of the device are investigated. The electron temperatures of oxide cathodes and matrix cathodes are measured and show good correspondence with the thermodynamic temperature. A maximum difference of 20 K exists between the electron and thermodynamic temperatures for the two cathodes studied. No explanation is given for this difference in the two temperatures. (Author)

AD-256 693 Div. 8
(29 May 61) OTS price $11.00

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
SOME EFFECTS OF ION BOMBARDMENT ON THE EMITTING PROPERTIES OF OXIDE-COATED CATHODES,
by H. Hollister. Technical rept. no. 7 on Linear Beam Microwave Tubes. 30 Oct 60, 131p. incl. illus. 40 refs. (Research rept. no. EE-482)
(Contract AF 30(602)1696)
(RADC TN 61-81) Unclassified report

DESCRIPTORS: *Electron tubes, Cathodes (Electron tubes), *Oxide cathodes, Ion beams, *Ion bombardment, Ions, Oxygen, Argon, Carbon compounds, Monoxides, Thermionic emission, Gases, Ion sources, Direct current, Measurement, Temperature, Microwave equipment.

An apparatus was developed with which it was possible to study the effect of ion bombardment by ions of oxygen, carbon monoxide, and argon on the emitting properties of oxide-coated cathodes. A description is given of the development of an ion gun capable of delivering an ion current of up to 3 microamperes/sq cm on a target maintained at a pressure of 1(10) to the -7th power mm Hg. This apparatus was used in an investigation of the general effects of ion bombardment by oxygen, carbon monoxide, and argon. In order to explore the use of ionic deposition as a tool in studying the effect of chemical agents of the gas phase on the emission of oxide-coated cathodes, a detailed study was made of the effects of ion bombardment by oxygen and carbon monoxide as functions of: (1) voltage of the pulse used to measure the emission, (2) ion beam density, (3) ion energy, (4) d-c current through the cathode, and (5) the temperature of the cathode. (Author)

AD-256 694 Div. 8
(29 May 61) OTS price $7.60

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
LARGE-SIGNAL THEORY OF GRIDDED KLYSTRON GAP,
by W. M. Sackinger. Technical rept. no. 8 on Linear Beam Microwave Tubes. 15 Nov 60, 70p. incl. illus. 18 refs. (Research rept. no. EE-483)
(Contract AF 30(602)1696)
(RADC TN 61-82) Unclassified report

DESCRIPTORS: *Klystrons, Electric fields, Oscillation, Electrodes, Space charges, Electron beams, Motion, Particle trajectories Mathematical analysis, Theory, Reduction, X-rays, Radiation hazards, Radio signals, Velocity.

A general theoretical expression is derived for an electron trajectory in an oscillating electric field. The limits upon the validity of the analysis are found, and application is made to the ballistic theory of gridded klystron gaps. In the case of the input gap, exact results for exit current and exit velocity are obtained for large signals, the only restriction being that the normalized modulation voltage magnitude be less than the normalized gap length. Large-signal analytical expressions for exit current and exit velocity are obtained for an output gap, and results of numerical calculations are presented graphically for several arbitrary cases. It appears from these results that an r-f structure placed beyond the output gap could be used to reduce the velocities of high-velocity electrons in the beam, and help reduce production of X-rays at the collector. (Author)

AD-256 695 Div. 8
(29 May 61) OTS price $9.10

Cornell U. School of Electrical Engineering, Ithaca, N. Y.
A DESIGN METHOD FOR VOLTAGE-VARIABLE OSCILLATORS AND DELAY LINES,
by J. Thorp. Technical rept. no. 60 on Electronics Research. 15 Dec 60, 97p. incl. illus. tables, 26 refs. (Research rept. no. EE-485)
(Contract DA 36-039-sc-85272)
Unclassified report

DESCRIPTORS: *Oscillators, *Delay lines, *Phase shifters, Electrical networks, *Oscillator circuits, Broadband, Amplifiers, Microwave amplifiers, *Electron tubes, *Microwave oscillators, *Electronic circuits, Transmission lines, Microwave networks, Mathematical analysis, Design.

A common configuration for electronically variable oscillators and time delay lines is presented, which uses a variation of the link-amplifier structure and tubes with electronically variable transconductances to provide electronically variable phase-shift characteristics. The responses of alternate signal paths with different electrical lengths are added with electronically variable delay. Examples are given of 4 different networks with variable time delay. A linear analysis of an oscillator that uses such networks as electronically variable phase-shift networks is presented. Various suggestions are made for improving the tube utilization of these oscillators, including the use of constant-k and constant-resistance networks in common structure and the use of tapered ladders. Means of providing electronically variable tube transconductance are discussed and experimental verification of one of these is presented. A practical delay line is designed and the features that would cause difficulty in construction are investigated. Attempts to reconcile these difficulties proved successful. (Author)

AD-256 710 Div. 8, 6
(29 May 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech. Lexington.
THE PHASE PERIODOGRAM DETECTOR,
by E. J. Kelly. 17 May 61, 15p. incl. illus.
(Rept. no. 47G-0025)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Phase detectors, Radar pulses, Doppler radar, Probability, Detection, Least squares method, Mathematical analysis, Radar targets.

The performance of the phase periodogram detector to detect a radar signal in noise and the probability of false alarm detection are mathematically stated. An approximate solution is obtained for the detection probability in the strong signal case.

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-256 714 Div. 8
(29 May 61) OTS price $1.60

Microwave Associates, Inc., Burlington, Mass.
VARACTOR DIODE INDUSTRIAL PREPAREDNESS MEASURES.
Quarterly progress rept. no. 3, 25 Dec 60-24 Mar 61. 24 Mar 61, 11p. incl. illus.
(Contract DA 36-039-sc-85941)
Unclassified report

DESCRIPTORS: *Diodes, *Variable capacitors, Microwave equipment, Silicon, Packaging, Reliability, Manufacturing methods, Production, Tests, Automation, Processing, Impedance.

Investigation concerns the design and development of an improved varactor package assembly process. The semiautomation and improved hermetic package reliability obtained are explained in detail. Results indicated that the present process is a superior method of obtaining reliable hermetically sealed packages at a satisfactory output. A discussion is also presented of microwave characteristics of state-of-the-art samples along with illustrations. (Author)

AD-256 715 Div. 8
(29 May 61) OTS price $6.60

Motorola, Inc., Scottsdale, Ariz.
STUDY OF ELECTRONIC EQUIPMENT LIFE PREDICTION,
by A. T. Kneale. Final rept. 1 July 59-31 Dec 60. 31 Dec 60, 66p. incl. illus. tables, 32 refs.
(Contract DA 36-309-sc-78952)
Unclassified report

DESCRIPTORS: Instrumentation, *Electronic equipment, Life expectancy, Mathematical prediction, Mathematical anlysis, *Test sets, Probability, Reliability, Failure (Mechanics), Test equipment, Matrix algebra, Measurement, Design, *Communication equipment, *Radar equipment.

Research was concerned with determining the feasibility of providing instrumentation capable of deriving a quantitative expression for the rate of degradation of performance of the electronic equipment. The rate of degradation was to be measured directly on an individual electronic equipment and expressed in terms of operating-time-remaining until failure. The major work accomplished was as follows: (1) development of a physical-mathematical model of the failure prediction process as applied by human beings or mechanized in test equipment, (2) development of techniques for determining significant measurements usable in the failure prediction problem and applicable to any electronic equipment, (3) specification of mathematical tests for the assurance of both the adequacy of the number of measurements chosen and for minimizing the number of measurements required in a given situation, and (4) development of a design plan for implementing and field testing the life prediction process on communications and radar equipment. (Author)

AD-256 716 Div. 8, 25
(29 May 61) OTS price $2.60

Melabs., Palo Alto, Calif.
INVESTIGATION OF MICROWAVE NON-LINEAR EFFECTS UTILIZING FERROMAGNETIC MATERIALS,
by Roy W. Roberts. Quarterly progress rept. no. 2, 8 Mar 61-3 Apr 61. 18 Apr 61. 20p. incl. illus.
(Contract DA 36-039-sc-87412)
Unclassified report

DESCRIPTORS: *Ferromagnetic materials, *Ferrites, *Frequency multipliers, *Garnet, *Microwave amplifiers, Microwaves, Non-linear systems, Single crystals, Crystals, Electronic equipment, Microwave equipment, Theory, Electromagnetic properties, Nickel compounds, Zinc compounds, Tests, Yttrium compounds.

The non-linear effects in the microwave properties of ferrites and ferrimagnetic-garnet materials are being studied. Two milimeter wave generation experiments using nickel-zinc ferrite and Ferroxplana type hexagonal single crystals are described. The hexagonal material did not give a high conversion efficiency. An analysis of a longitudinally pumped ferrite amplifier is given. Expressions for gain, bandwidth, gain-bandwidth product and noise temperature are derived. Experimental observations of a relaxation type oscillation are given. (Author)

AD-256 741 Div. 8
(31 May 61) OTS price $3.60

Airborne Instruments Lab., Inc., Mineola, N. Y.
APPLICATION OF SEMICONDUCTORS DIODES TO LOW-NOISE AMPLIFIERS, HARMONIC GENERATORS, AND FAST-ACTING TR SWITCHES,
by J. C. Greene, F. G. Hanemann and others. Quarterly progress rept. no. 10, Dec 60, 1v. incl. illus. tables, 13 refs. (Rept. no. 4589-I-10)
(Contract AF 30(602)1854)
(RADC TN 61-18) Unclassified report

DESCRIPTORS: *Semiconductors, Noise (Radar), *Diodes, *Microwave amplifiers, Harmonic oscillators, *Microwave oscillators, C-band, Transmit-receive tubes, Amplifiers, L-band, *Switching circuits, *Radar equipment, Design, Sensitivity, Broadband, Tests.

A study was made to determine the simplest method by which the one-port parametric amplifier could be made voltage tunable over the 1250 to 1400 mc frequency range. A further analysis of the sensitivity of a radar set using a degenerate parametric amplifier was made, and the results indicate that it is usually desirable to detune the amplifier from the degenerate point. The best commercially-available varactor diodes were evaluated to determine the figures of merit obtainable with them. An experimental C-band degenerate amplifier was evaluated with the aid of a swept signal source. The measured amplifier performance indicated a total fixed-tuned bandwidth of 400 mc with a peak signal-to-signal gain of 19 db and a broadband noise figure of 1.5 db. A tunnel diode amplifier was designed and tested. A second-harmonic generator using an experimental gallium-arsenide abrupt-junction diode was tested with a fundamental input frequency of 30 kmc. (Author)

AD-256 746 Div. 8, 25
(31 May 61) OTS price $11.50

Case Inst. of Tech., Cleveland, Ohio.
HIGHER ORDER EVALUATION OF THE DIFFRACTION OF

ELECTROMAGNETIC FIELDS BY CIRCULAR DISKS,
by Wilhelm H. Eggimann. 31 Jan 61, 148p. incl. illus. tables, 56 refs. (Scientific rept. no. 21)
(Contract AF 19(604)3887)
(AFCRL 77) Unclassified report

DESCRIPTORS: *Electromagnetic fields, Electromagnetic waves, Series, Analysis, *Diffraction, Theory, Waveguides, Disks, Conductors, *Electromagnetic wave reflections, Power, Scattering, Magnetic moments, Integrals, Tables, Differential equations, Diffraction.

The diffraction of an electromagnetic field by a circular perfectly conducting disk is investigated. Following a method outlined by Bouwkamp, the induced current is obtained as a power series expansion in (ka) (k = wave number, a = disk radius). General expressions for the electric and magnetic dipole moments are obtained. The scattering cross-section and higher order multipole moments are calculated for a plane wave at oblique incidence. The theory is applied to disks in the tranverse plane of a rectangular waveguide. The theory of images is employed to calculate the interaction between the disks, and the disks and the guide wall. The theoretical results are compared with experimentally obtained values. (Author)

AD-256 750 Div. 8, 7, 14
(31 May 61) OTS price $3.60

Clevite Corp., Cleveland, Ohio.
DEVELOPMENT AND EVALUATION OF A HIGH TEMPERATURE DIELECTRIC MATERIAL FOR CAPACITORS,
by John Koenig. Final rept., 1 Oct 59-31 Jan 61, 14 Mar 61, 33p. incl. illus. tables.
(Contract NObs-78108, Proj. 30198-G)
Unclassified report

DESCRIPTORS: *Dielectrics, *Ceramic materials, *Capacitors, Materials, High temperature research, Dielectric properties, *Ceramic capacitors, Barium compounds, Lanthanum compounds, Titanates, Aluminates, Zirconates, Oxides, Resistance, Determination, Measurement, Design, Temperature.

The ceramic compounds investigated were $BaZrO_3$, $LaAlO_3$ and $La_2Ti_2O_7$ modified by the following partial cationic substitutions: Ba(2+) by La(3+), Zr(4+) and Ti(4+) by Nb(5+) and Al(3+) by Si(4+). Among these compounds $(Ba_{.97}La_{.02})ZrO_3$, $(Ba_{.94}La_{.04})ZrO_3$, and $(Ba_{.91}La_{.06})ZrO_3$ had the best dielectric properties. At 350 C, their dielectric constants were about 36, Q values were 400 or greater, volume resistivities were about 5 x 10 to the 9th power ohm-meters, and (RC) products far in excess of 1 megohm-microfarad. The change of dielectric constant from 23 to 250 C was about -4%. Life tests lasting 1000 hr were carried out on 0.010-in.-thick wafers at 250 C, 350 C and 500 C at 60 v dc/mil. The final (RC)-products ranged at 250 C from 1400-6500 megohm-microfarad and at 350 C from 100 - 140 megohm-microfarad. At 500 C the test samples deteriorated by partial reduction and electrode diffusion. Very high dielectric strength was observed at 105 C. (Author)

AD-256 753 Div. 8
(31 May 61) OTS price $11.50

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
TECHNIQUES FOR LINEAR AMPLIFIER TUBE AND CIRCUIT DESIGN,
by R. E. Meek, G. H. Smith and others. Final rept. 16 Dec 59-16 Dec 60. 16 Dec 60, 141p. incl. illus. tables, 33 refs.
(Contract AF 30(602)2146, Proj. A-479)
(RADC TR 61-90) Unclassified report

DESCRIPTORS: *Electron tubes, *Electronic circuits, *Vacuum tube amplifiers, Amplifiers, *Microwave amplifiers, Space charges, Electron beams, Power amplifiers, Feedback, Design, Impedance, Test equipment, Reliability, Modulation, *Communication equipment, *Interference.

An investigation was conducted of all currently known techniques of vacuum tube and circuit design that would aid in the development of a design for a low distortion linear amplifier, particularly for high frequency application. Beam-deflection techniques offer a means of space charge control that appears capable of producing linear amplification. Emission from metals by high field intensities was investigated as a technique to avoid the space charge control problem. Intermodulation suppression values from 50 to 70 db were obtainable from conventional amplifier tube types investigated. Conventional RF feedback was found superior to other types of feedback, which included envelope feedback, ultra linear circuits, and screen clamping techniques. A demonstration model linear power amplifier was constructed using grid biasing techniques and RF feedback that produced one kilowatt PEP with third and fifth order intermodulation suppression values of -55 db and -50 db respectively. A demonstration model distortion monitor was developed to demonstrate a practical and inexpensive means to obtain a field test instrument for monitoring the distortion output of a linear amplifier. Load impedance monitoring techniques are described which are partical to construct and are important in the application of distortion suppression techniques. (Author)

AD-256 754 Div. 8
(31 May 61) OTS price $3.60

Hughes Aircraft Co., Newport Beach, Calif.
NEW DEVICE AND CIRCUIT FEASIBILITY (TUNNEL DIODE),
by R. J. Andres, R. Solomon and others. Quarterly rept. no. 3, 1 Jan-31 Mar 61. 31 Mar 61, 36p. incl. illus. tables.
(Contract DA 36-039 sc-85065)
Unclassified report

DESCRIPTORS: *Diodes, Gallium compounds, *Semiconductors, Arsenides, Zinc, Materials, Tests, Temperature, Crystals, Germanium, Impurities, Electronic circuits, Amplifiers, *Subminiature electronic equipment, *Microwave amplifiers, *Microwave oscillators, Design, Manufacturing methods, Electron tubes, Oscillators.

Heavily zinc-doped GaAs was prepared out of gallium-rich melts and out of arsenic-rich melts. Optimum tunnel diode characteristics were obtained from a zinc-gallium solution of a mole fraction of .08. An analysis of data on the stability of GaAs tunnel diodes at high temperatures indicated that the trend with a given diode is consistent; some being stable and continuing to maintain their parameters while others showed steady deterioration. Further study of germanium-doped diodes showed these to

be unstable at high temperatures, which leads to the possibility that crystal structure rather than diffusion of dopants is responsible for the behavior. A number of GaAs tunnel diodes of both alloy junction and point contact types were fabricated in the microminiature dot package for circuit evaluation. Some mechanical instability was encountered in the point contact diode and correction of this is under study. A tunnel diode frequency down converter which operated at 2 kmc. was designed and constructed. A microwave structure was built and operated both as a capacitively loaded coaxial cavity and as a heavily loaded inductively coupled radial cavity. (Author)

AD-256 762 Div. 8
(31 May 61) OTS price $3.60

Electron Physics Lab., U. of Michigan, Ann Arbor.
RESEARCH AND DEVELOPMENT ON HIGH-POWER CRESTATRONS FOR THE 100-300 MC FREQUENCY RANGE,
by G. T. Konrad and C. Yeh. Quarterly progress rept. no. 3, 1 Jan-1 Apr 61. 1 Apr 61, 31p. incl. illus. (Rept. no. 03783-3-P)
(Contract NObsr-81403)

Unclassified report

DESCRIPTORS: *Radiofrequency amplifiers, Amplifiers, Electron tubes, *Electron guns, Electron beams, Helixes, Very high frequency, Design, Tests, Space charges, Theory, Focusing, Triodes, Test equipment, Coupling circuits.

Research and development work was continued on both 100-watt and 1000-watt UHF, CW crestatrons. RF transitions were worked out by two methods, each yielding a VSWR of less than 2:1 across the operating frequency band. One of the several gun designs under consideration was tested in conjunction with a depressed potential beam collector. Several precision glass tube envelopes were successfully constructed. Some initial results of the theoretical analysis of the effect of coupled helices on crestatron operation are presented. (Author)

AD-256 768 Div. 8, 2, 25
(31 May 61) OTS price $3.60

Naval Research Lab., Washington, D. C.
ATMOSPHERIC REFRACTION OF RADIO-FREQUENCY ELECTROMAGNETIC WAVES,
by P. F. Nicholson. 6 Apr 61, 36p. incl. illus. (NRL rept. no. 5607)

Unclassified report

DESCRIPTORS: Electromagnetic waves, Radiofrequency, *Atmosphere, Refraction, *Propagation, Electromagnetic wave reflections, Radio transmission, Ionospheric propagation, *Radio waves, Ionosphere, Tables, Programming, Computers, Snells law.

Propagation of an electromagnetic wave through the earth's atmosphere is discussed. Even with the omission of effects due to the earth's magnetic field and deviations resulting from tropospheric and ionospheric inhomogeneities, ray tracing is quite difficult. The relatively simple method of dividing both the troposphere and ionosphere into a number of spherically stratified layers and summing progressively the refraction in each layer has allowed accommodation of a wide range of refractive index distributions. Several profiles have been selected to explore influences such as the diurnal, seasonal, and sunspot effects on the total atmospheric refraction. General changes in the tropospheric profile caused by fluctuations in relative humidity and other smaller effects such as perturbations of the upper profile are also discussed. From the given graphical presentations and suggestions for the programming of other relevant profiles, the tracking engineer or radio astronomer may easily determine the influential factors leading to a realistic assessment of a curve for refraction error suitable to his own particular situation. (Author)

AD-256 774 Div. 8
(31 May 61) OTS price $1.60

Stanford Electronics Labs., Stanford U., Calif.
MICROWAVE PHONONS IN QUARTZ RODS,
by A. G. Little. 21 Apr 61, 9p. incl. illus. (Technical rept. no. 212-1)
(Contract AF 33(616)6207)

Unclassified report

DESCRIPTORS: *Microwaves, *Phonons, Ultra high frequency, Quartz, Harmonic analyzers, Electromagnetic waves, Piezoelectric effect, Attenuation, Measurement, Wave characteristics, Surfaces, Tests, Radiofrequency generators, Radiofrequency pulses, Rods, Reflection.

An experiment is described which showed the existence of second harmonics generated in a quartz rod when excited with hypersonic waves at 390 mc. The origin of the harmonics remains uncertain, but is thought to be at the surface of the quartz where microwave energy is used to excite the sound waves. (Author)

AD-256 775 Div. 8, 25
(31 May 61) OTS price $11.00

Stanford Electronics Labs., Stanford U., Calif.
PASSIVE PHASE-DISTORTIONLESS PARAMETRIC LIMITERS,
by I. T. Ho. 24 Apr 61, 134p. incl. illus. (Technical rept. no. 157-2)
(Contract AF 33(616)6207)

Unclassified report

DESCRIPTORS: *Microwave networks, *Limiters, *Crystal limiters, Power, Circuit breakers, Current limiters, Very high frequency, Theory, Experimental data, Diodes.

Both theoretical and numerical analyses are presented to describe phase-distortionless passive parametric limiters. Leakage-spike energy, a troublesome problem when a limiter is used as a protecting device, is small in varactor diode versions, and large in ferrite versions. The analytical result which predicts the behavior of the leakage spikes may be used to control the leakage energy by adjusting certain parameters. When input power keeps increasing, the experimental work shows that the leakage energy will first increase, then saturate and then vanish, which agrees very well with the theoretical prediction. Certain desirable properties of a

varactor diode to be used as the nonlinear device in a parametric limiter are shown. While ferrite-slab limiters work at a high-power level, and garnet-sphere limiters at a very low power level, the varactor-diode limiter seems to fill the gap perfectly in a medium power level. A series of these three limiters will yield a dynamic range of over 80 db. With some modification, the parametric limiter can be used as a harmonic generator, switching device, or filter. (Author)

AD-256 776 Div. 8, 12
(29 May 61) OTS price $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
EXPERIMENTAL INVESTIGATION OF THE ELECTROMAGNETIC EFFECTS OF REENTRY,
by W. Rotman and G. Meltz. Mar 61. 22p. incl. illus. (AFCRL-87)
Unclassified report

DESCRIPTORS: Re-entry vehicles, *Re-entry aerodynamics, Plasma physics, *Electromagnetic effects, Ionization, Radio signals, *Radio interference, Radio transmission, *Antenna radiation patterns, Attenuation.

The instrumentation and expected results of a forthcoming missile test are described. The initial results of a plasma simulation experiment and those of flow field and antenna pattern computations are summarized in graphs and briefly discussed. (Author)

AD-256 788 Div. 8
(29 May 61) OTS price $1.60

Electronic Defense Labs., Mountain View, Calif.
A BROAD-BAND BALANCED MIXER USING MICRO-MIN DIODES,
by Robert G. Veltrop. 17 Mar 61. 12p. incl. illus. (Technical memo. no. EDL-M326)
(Contracts DA 36-039-sc-85402 and DA 36-039-sc-87475)
Unclassified report

DESCRIPTORS: *Mixer tubes, Electron tubes, *Diodes, Broadband, *Crystal mixers, L band, S band, Dielectrics, Transmission lines, *Subminiature electronic equipment, *Coupling circuits, Design, Microwave oscillators, Noise (Radar), Reduction, Tests.

A 1.0- to 4.0-kmc balanced mixer was designed and fabricated in solid dielectric stripline. The device consists of a three-section 3-db electromagnetic coupler and two series mounted 1N831 micro-min diodes forming the mixer unit. The broad-band coupler and the mixer unit were packaged separately for the developmental model, but the two can be integrated into one unit in a future design. Physical and electrical design of the balanced mixer is outlined, and performance of the device is presented in detail. (Author)

AD-256 814 Div. 8
(31 May 61) OTS price $6.60

Armour Research Foundation, Chicago, Ill.
GALVANOMAGNETIC AMPLIFIER INVESTIGATION.
Final rept. 6 Feb 61, 63p. incl. illus. tables.
(Contract AF 30(602)2167, ARF Proj. E129)
(RADC TR 61-81) Unclassified report

DESCRIPTORS: *Microwave amplifiers, Theory, Amplifiers, Magnetic fields, *Semiconductors, Indium compounds, Intermetallic compounds, Antimonides, Mathematical analysis, Tests, Dielectrics, Measurement.

Research was concerned with the theoretical and experimental feasibility analysis of galvanomagnetic amplifiers operating in the microwave frequency range between one and five kilomegacycles. Theoretical and experimental work was carried out in connection with basic descriptions of the phenomena involved, amplifier gain evaluation, optimization of microwave magnetic fields, and semiconductor mobility determination at microwave frequencies. The measurement of Hall mobility of indium antimonide at microwave frequencies indicated that no radical change from the DC value occurs. Although amplifiers of this type were shown to be feasible at audio frequencies this was not found to be the case in the microwave region because of difficulties in obtaining large enough magnetic fields for given power inputs. Theoretical gains, for CW operation in air filled cavities, of the order of 10 to the -8th power were obtained for both magnetoresistive and Hall amplifiers. Dielectric loading and pulsed operation brought the expected gain to 1/1000. This last figure was verified experimentally. (Author)

AD-256 853 Div. 8, 7, 15, 30
(1 June 61) OTS price $4.60

Electronics Research Lab., U. of Calif., Berkeley.
MINIMAL TIME REGULATOR PROBLEMS FOR LINEAR SAMPLED-DATA SYSTEMS (GENERAL THEORY),
by C. A. Desoer and J. Wing. 14 Feb 61, 37p. incl. illus. 18 refs. (Scientific rept. no. 6; Series no. 60, Issue no. 346)
(Contracts AF 19(604)5466 and AF 18(600)1521)
(AFCRL-149)
(AFOSR-424) Unclassified report

DESCRIPTORS: Linear systems, *Statistical analysis, *Sampling, Matrix algebra, Control, Control systems, *Servomechanisms, Theory.

A sampled-data control system is considered in which the plant transfer function is a constant divided by an N'TH-order polynomial in s. The control signal f(t) goes through a sampler of period T and a zero-order hold circuit. The problem is: given an arbitrary set of initial conditions, find the control f(t), satisfying /f(t)/ equals or is less than 1, and the corresponding optimal strategy to generate that control which will bring the system to equilibrium in the minimum number of sampling periods. (Author)

AD-256 854 Div. 8, 30
(31 May 61) OTS price $2.60

Hallicrafters Co., Chicago, Ill.
DIGITAL PULSE ANALYZER,
by Monte Ross and James Knapp. Progress rept. no. 1, 1 July 60-1 Jan 61. 1 Mar 61, 17p. incl. illus.
(Contract DA 36-039-sc-84974, Proj. 3E44-02-001)
Unclassified report

DESCRIPTORS: *Pulse analyzers, Delay lines, *Digital systems, *Computers, Temperature, Memory devices, Printed circuits.

A 20-mc decade counter was designed. A breadboard circuit for pulse width measurements was fabricated. A digital delay circuit was developed for use in the pulse repetition period (PRP) analysis unit, and a breadboard for the PRP analysis unit was fabricated and tested. Work is continuing on a pulse amplitude memory circuit. An experimental printed circuit board containing 18 bistable units was built. No unusual problems have been encountered in any phase of development. (Author)

AD-256 855 Div. 8
(31 May 61) OTS price $1.60

General Electric Co., Owensboro, Ky.
A C-BAND CW TUBE AND CAVITY COMBINATION FOR TRANSPONDERS,
by J. B. Quirk, E. D. Wilson, and J. M. Connelly. Quarterly progress rept. no. 3, 1 Jan-31 Mar 61. 31 Mar 61. 8p. illus.
(Contract DA 36-039-sc-85366)
Unclassified report

DESCRIPTORS: *Electron tubes, C band, *Radar beacons, Microwave oscillators, Triodes, Ceramic materials, Frequency shift, Frequency, Stability.

Frequency drift curves as a function of variations of both heater supply voltage and plate supply voltage are presented. Results of measurements on a new tube type, XD76DA are included. Another new tube type, XD76DB is introduced. Results of thermal and mechanical shock tests are given. Design of Oscillator III, which will incorporate the type XD76DB was mentioned. Frequency stability of Oscillator II with power supply fluctuations seems satisfactory. Power output is, however, less than that desired. (Author)

AD-256 858 Div. 8
(1 June 61) OTS price $3.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE ELECTRICAL EVALUATION OF 110 FOOT DIAMETER METAL SPACE-FRAME MODEL RADOMES AND THE CW-413 RADOME,
by A. Cohen and A. W. Maltese. 25 Apr 61. 36p. incl. illus. (Rept. no. 76G-0003)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Radomes, Radar antennas, Distortion, Measurement, Model tests, Wave transmission, Electrical properties, K-band, Electromagnetic properties, Electromagnetic waves, Polarization, Tests, Test methods, Antenna radiation patterns, Impedance, S-band.

The results of an electrical evaluation of ground rigid radomes are reported. This evaluation included the measurement of the effects of two 110 foot equatorial diameter metal space-frame radomes (scale model versions) to the radiation characteristics of linear polarized antennas. These measurements were made at K-Band frequencies. In addition to measuring the effects to antenna patterns and transmission loss, two plane boresight shift and boresight shift rate measurements were made with one of these models. Also, two plane boresight shift measurements at S-Band were obtained for a 26 1/2 foot equatorial diameter dielectric radome. (Author)

AD-256 868 Div. 8, 5, 25
(1 June 61) OTS price $7.60

Raytheon Mfg. Co., Waltham, Mass.
STUDY OF IONOSPHERIC SCATTERING EFFECTS AT 50 MEGACYCLES,
by Harry Hoogasian. Interim rept. no. 1, 1 Feb 59-1 Feb 60. 30 Dec 60. 69p. incl. illus. tables.
(Contract AF 19(604)5230)
(AFCRL-71) Unclassified report

DESCRIPTORS: Ionosphere, *Ionospheric propagation, *Radio waves, Radio transmission, Scattering, Antennas, Very high frequency, *Radio communication systems, Radio reception.

The forward scattering of 50-mc radio waves from the lower ionosphere was investigated. The observations relate to an approximately 1000-mile circuit from Havana, Illinois to Scituate, Massachusetts. Three separate subjects were investigated: (1) height-gain effects, (2) split-beam effects, and (3) multipath phase distortion. Three receiving antennas were assembled at elevations designed to align the vertical lobes with the direction of downward scattering at heights of 75, 85 and 100 kms above the path midpoint. An analysis of the output of these antennas showed less variation in received power with elevation than predicted on the basis of simple lobe-alignment theory. There was a qualitative correspondence between diurnal output variations and known variations in the height of the scattering region. Bi-seasonal peak amplitudes were observed during May and June and again in December. Horizontal angle-of-arrival measurements were made by using the split-beam properties of 2 phased Yagi antennas. The properties of the scatter medium downgraded most of the plane-wave advantage of the rhombic over the Yagi. CW amplitude measurements were interrupted to permit single sideband transmissions. Relatively little phase changes were observed during occurrences of high signal levels associated with discrete echoes from over-dense meteor trails. (Author)

AD-256 869 Div. 8, 6, 25
(1 June 61) OTS price $8.10

Westinghouse Electric Corp., Baltimore, Md.
SOLID STATE SWITCH STUDY.
Final rept. 26 May 61. 78p. incl. illus. tables, 6 refs.
(Contract AF-30(602)2207, Proj. no. 4506)
(RADC TR 61-94) Unclassified report

DESCRIPTORS: *Modulators, *Radar equipment, *Pulse modulation, *Electronic switches, *Switching circuits, *Transistors, *Thyratrons, Semiconductors, Rectifiers, Analysis, Saturable reactors, Operation, Solid state physics, Life expectancy.

The study and development of techniques and circuitry in the application of Solid State devices to radar modulators are described. The use of transistor switches, along with their capabilities is briefly discussed. The application of Trinistors (PNPN switches) however, is considered in great detail as their use represents the most attractive and practical method of attaining the specified peak pulse powers of

1 to 20 megawatts. It is shown that a solid state Line Pulsing Type radar modulator capable of switching 1 to 20 megawatts is feasible. The basic circuitry and the Trinistors that could be used in such an application were fully evaluated. Although this evaluation was performed at medium power and voltage levels, by simple scaling of the results, powers in the megawatt range can be achieved. It was also found that no basic limitation was found as to the number of Trinistors that can be placed in series. Thus, it appears that no limit exists in the peak or average power that can be generated. (Author)

AD-256 876 Div. 8, 25
(2 June 61) OTS price $7.60

David Sarnoff Research Center, Princeton, N. J.
RESEARCH IN ELECTRON EMISSION FROM SEMICONDUCTORS,
by R. E. Simon and E. K. Gatchell. Quarterly rept. no. 2, 1 Jan 61 to 31 Mar 61, 31 Mar 61, 70p., incl. illus. tables, 86 refs. (Rept. no. 10) (Contract DA 36-039-sc-87388, Proj. no. 3A-99-13-1001; Continuation of Contract DA 36-039-sc-78155)
Unclassified report

DESCRIPTORS: *Thermionic emission, Theory, Materials, *Field emission, *Semiconductors, Coupling circuits, Electrons, Temperature, Surfaces, Electric fields, Cesium, Metals, Conductivity, Crystals, Voltage, Lattices, Plasma physics, Electron optics, Analysis, Measurement.

A review of hot electron effects in the multiplication region is presented as a continuation of the literature survey presented in AD-254 178. Experimental work on multiplication, avalanche breakdown, and microplasmas and theoretical attempts to explain these data are discussed. The state of knowledge on the effect of low work function metals in reducing the electron affinity of semiconductors is described. A model for hot electron emission from a p-n junction is described and the implications of the results of the literature survey on the design of the junction for optimum hot electron emission are considered. (Author)

AD-256 883 Div. 8
(2 June 61) OTS price $9.10

Stanford Research Inst., Menlo Park, Calif.
INVESTIGATION OF METHODS OF SCANNING THE BEAM OF LARGE ANTENNAS,
by M. G. Andreasen, P. S. Carter, Jr., and W. F. Gabriel. Final rept. part 1, 1 Sep 60-31 Jan 61. Mar 61, 95p. incl. illus. table, 16 refs. (Contract AF 19(604)2240) (AFCRL-160, pt. 1)
Unclassified report

DESCRIPTORS: *Antennas, Lens antennas, *Antenna radiation patterns, Electronic scanners, Radar antennas, High frequency, Phase shifters, Single crystals, Ferromagnetic materials, Materials, Antenna couplers, Transmission lines, Reflectors, Microwave amplifiers, Theory, Interferrometers, Tests, Design, Antenna horns, Mathematical analysis, Propagation.

The study on wire-grid HF lens antennas is a new research topic that shows great promise. A theoretical and experimental investigation is presented of the properties of a wire grid placed above a ground plane. A general theoretical investigation on a radial horn with arbitrarily variable flare angle showed that the connection of a radial horn to the rim of a circular lens had a very minor effect upon the ideal radiation pattern of the lens, and that the reflection at the rim of the lens was also very small. A new type of electrically variable phase shifter was analyzed and demonstrated experimentally. Items also investigated included: (1) mutual coupling effects in scanning antenna arrays, (2) reduction of the number of elements in an array, (3) a corrected line source feed for a spherical reflector, (4) the compound interferometer as a possible radar antenna, (5) linear arrays with unequal element spacing, (6) a toroidal-band line-source scanner, (7) various types of electronic phase shifters, and (8) low-noise parametric amplifiers. (Author)

AD-256 896 Div. 8, 25
(2 June 61) OTS price $4.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
TOTAL MOLECULAR ABSORPTION IN THE ATMOSPHERE FOR FREQUENCIES BELOW 380 KMC,
by R. J. Schmelzer. Technical rept. on Physical Electronics. Mar 61, 1v. incl. illus. tables, 46 refs. (Rept. no. LMSD-895084)
Unclassified report

DESCRIPTORS: *Electromagnetic waves, Propagation, Absorption, Atmosphere, *Radio waves, *Radio communication systems, Water vapor, *Satellite vehicles, Attenuation, Humidity, Mathematical analysis, Microwaves, Quantum mechanics, Molecular rotation, Measurement, Dipole moments, Oxygen, Theory.

Calculations were made on total molecular absorption in the atmosphere for frequencies below 380 kmc. Although the primary purpose of the work is to select frequencies for use in communications satellites, results are useful for estimating the weaknesses or advantages of communications systems through the earth's atmosphere. A number of measurements and calculations were made at sea-level conditions or in the lower atmosphere but only a few through the entire atmosphere. Calculations are given for absorption due to oxygen and water vapor. (Author)

Division 9 - FLUID MECHANICS
9. FLUID MECHANICS

AD-256 019 Div. 9, 15
(16 May 61) OTS price $5.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
BOUNDS FOR SOLUTIONS OF SECOND ORDER ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS,
by J. H. Bramble and L. E. Payne. Apr 61, 53p. (Technical note no. BN-237)
(Contract AF 49(638)228)
(AFOSR-590) Unclassified report

DESCRIPTORS: *Fluid mechanics, Mathematical analysis, *Partial differential equations, Applied mathematics.

Pointwise a priori bounds are obtained for the solution of the Dirichlet problem associated with a rather general second order elliptic differential operator. These bounds involve only integrals of the data itself and not if its derivatives. Furthermore, the bounds obtained are applicable at any point in the domain of definition (i.e. up to the boundary of the region). (Author)

AD-256 027 Div. 9
(16 May 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC CHARACTERISTICS OVER A MACH NUMBER RANGE OF 1.40 TO 2.78 OF A ROCKET-PROPELLED AIRPLANE CONFIGURATION HAVING A LOW 52.5 DEGREE DELTA WING AND AN UNSWEPT HORIZONTAL TAIL,
by Alan B. Kehlet. May 61, 26p. incl. illus. table (Technical note D-836, Supersedes NACA Research Memo. L58A23, AD-153 127)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-836.

DESCRIPTORS: *Triangular wings, Model tests, Damping, *Stability (Longitudinal), *Supersonics, *Rocket models, *Aerodynamic configurations, Instrumentation, Drag, Lift, Flight testing, *Rocket planes, *Research planes, *Supersonic research planes, *Aerodynamics, Determination.

A free-flight investigation of an airplane configuration having a low 52.5 degrees delta wing and an unswept horizontal tail was conducted over a Mach number range of 1.40 to 2.78. At a fixed tail setting of -3.0 degrees, the trim lift coefficient and angle of attack varied from about 0.12 to 0.04 and 3.8 degrees to 2.0 degrees, respectively. The base drag was approximately 5 percent of the total drag at trim lift. Lift-curve slope, static longitudinal stability, and damping in pitch were obtained only at Mach numbers of 2.59 to 2.74. Theoretical calculations of lift-curve slope and aerodynamic-center location were in good agreement with experimental results. (Author)

AD-256 028 Div. 9, 12
(16 May 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
CONSTANT DENSITY APPROXIMATIONS FOR THE FLOW BEHIND AXISYMMETRIC SHOCK WAVES,
by Albert G. Munson. May 61, 29p. incl. illus. table, 12 refs. (Technical note D-857)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-857.

DESCRIPTORS: Supersonics, *Blunt bodies, *Bodies of revolution, *Shock waves, Ellipsoids, Aerodynamic configurations, *Aerodynamics, Numerical analysis, Density, Equations, *Axially symmetric flow, Spheres, Differential equations, Parabolic bodies, Transformations (Mathematics).

The incompressible rotational flow equations are used to obtain solutions for the flow behind axisymmetric shock waves with conic longitudinal sections. The nonlinear part of the term due to rotation is retained in the analysis. Numerical results for standoff distance and stagnation point velocity gradient are presented for the case in which the shock wave is a paraboloid, a sphere, or an oblate or prolate ellipsoid. A similarity parameter is proposed which correlates approximately the flow behind geometrically similar shock waves at different free-stream conditions. (Author)

AD-256 029 Div. 9
(16 May 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
UNSTEADY AERODYNAMIC FORCES ON A SLENDER BODY OF REVOLUTION IN SUPERSONIC FLOW,
by Reuben Bond and Barbara B. Packard. May 61, 32p. incl. illus. (Technical note D-859)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-859.

DESCRIPTORS: Mathematical analysis, Moments, *Aerodynamics, *Bodies of revolution, *Supersonics, Oscillation, Deformation, Lift, Drag, Stability, Control, Stresses, Load distribution, Differential equations, Equations, Bessel functions, Parabolic bodies, Integral transforms, Supersonic flow, Cylindrical bodies.

Linearized slender-body theory is applied to the computation of aerodynamic forces on an oscillating, or deforming, body in supersonic flow. The undeformed body is a body of revolution and the deformed body is represented by movement of a line through the centers of the cross sections which are assumed to remain circular. The time dependence is based on sinusoidal motion. For a body of vanishing thickness the slender-body theory yields the apparent mass approximation as it is obtained for incompressible crossflow around a cylinder. Both linearized slender-body theory and the apparent mass approximation are used to calculate the pitching-moment coefficients on a rigid slender body with a parabolic arc nose cone, and these coefficients are compared with some experimental results. (Author)

AD-256 048 Div. 9, 2
(16 May 61) OTS price $4.60

New York U. Coll. of Engineering, N. Y.
MODELS OF RANDOM SEAS BASED ON THE LAGRANGIAN EQUATIONS OF MOTION,
by Willard J. Pierson, Jr. Technical rept. Apr 61, 39p. incl. illus. tables. 23 refs.
(Contract Nonr-28503)
Unclassified report

DESCRIPTORS: Mathematical analysis, *Water waves, *Hydrodynamics, *Ocean waves, Probability, Wave analysis.

The purpose of this paper is to derive three new random seaway models that appear to have some properties of actual seas not illustrated by previous models, to derive a few of these properties and discuss other possible properties, and to show how these models appear to be more realistic by comparing them with selected observations. These new models explain some of the difficulties that arise with the higher spectral moments. They may also be capable of giving some information about whitecaps, breaking waves, and sharp crested waves. Since all mathematical models of nature fail in one way or the other when the conditions and assumptions in the derivation are not met, these models will provide a second choice when observations of waves are to be compared with theoretical results. Some questions are raised that can only be answered by additional theoretical work and by precise measurements of waves. (Author)

AD-256 076 Div. 9
(18 May 61) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
LOW-SPEED WIND-TUNNEL INVESTIGATION OF A REFLECTION PLANE WING MODEL EQUIPPED WITH PARTIAL-SPAN JET-AUGMENTED FLAPS,
by James H. Otis, Jr. May 61, 53p. incl. illus. tables. (Technical note D-815)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-815.

DESCRIPTORS: *Wings, Flaps, Deflection, *Jets, Control surfaces, *Model tests, *Aerodynamic configurations, *Aerodynamics, Lift, Stability (Longitudinal), Wind tunnels, *Downwash.

An investigation was made in the Langley 300-MPH 7- by 10-foot tunnel with a semispan, rectangular unswept wing of full-span aspect ratio 8.3 and thickness-to-chord ratio of 0.167. Three 50-percent partial-span jet-augmented-flap configurations located inboard, outboard, and at the mid-semispan position were tested through a momentum coefficient range from 0 to about 10 and an angle-of-attack range from -10 degrees to approximately 28 degrees. The corresponding flow-field characteristics are presented for a longitudinal-tail position of 4 wing chords behind the trailing edge of the wing through a range of tail-height locations of + or - 2 chords. (Author)

AD-256 077 Div. 9, 5, 8, 12, 25
(18 May 61) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
THE GENERAL EQUATIONS OF EQUILIBRIUM OF ROTATIONALLY SYMMETRIC MEMBRANES AND SOME STATIC SOLUTIONS FOR UNIFORM CENTRIFUGAL LOADING,
by James G. Simmonds. May 61, 54p. incl. illus. (Technical note D-816)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-816.

DESCRIPTORS: Mathematical analysis, Stresses, *Satellite vehicles, *Communication equipment, Radio communication systems, *Bodies of revolution, *Aerodynamic configurations, *Radar antennas, Rotating structures, Elasticity, *Solar furnaces, Structures, *Membranes, *Antennas.

The general equations of equilibrium of a rotationally symmetric membrane undergoing arbitrary large deflections are derived. Static solutions for steadily rotating membranes are considered for the case when the final configuration of the membrane is known and for the case when the initial configuration is known. Methods of solution for both types of problems are indicated and several specific examples are worked out. (Author)

AD-256 078 Div. 9, 12
(18 May 61) OTS price $1.75

National Aeronautics and Space Administration, Washington, D. C.
MEASUREMENTS OF AERODYNAMIC HEAT TRANSFER ON A 15 DEG CONE-CYLINDER-FLARE CONFIGURATION IN FREE FLIGHT AT MACH NUMBERS UP TO 4.7,
by Charles B. Rumsey and Dorothy B. Lee. May 61, 61p. incl. illus. tables, 17 refs. (Technical note D-824, Supersedes NACA Research Memo. L57J10, AD-151 733)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-824.

DESCRIPTORS: *Aerodynamic heating, Heat transfer, *Conical bodies, Measurement, *Cylindrical bodies, Rocket models, *Bodies of revolution, Turbulent boundary layer, Instrumentation, Temperature, Supersonics, Hypersonics.

Measurements of aerodynamic heat transfer were made at a number of stations along a cone-cylinder-flare model having a 15 degrees total-angle conical nose and a 10 degrees half-angle flare skirt. The maximum Mach number was 4.7; and local Reynolds numbers based on body length to a measurement station varied from 2 x 10 to the 6th power to 138 x 10 to the 6th power. Local Stanton numbers measured on the nose cone and flare showed fair agreement with laminar and turbulent theories, while the measurements on the cylinder were generally somewhat lower than theory. Experimental recovery factors, determined twice during the test, were unaccountably lower than theoretical values. Local transition Reynolds numbers, based on length from the nose tip, varied from 3 x 10 to the 6th power to 18 x 10 to the 6th power and were much lower than values previously obtained on the smoother nose of a similar model. At an angle of attack of about 9 degrees, the heat transfer on the flare increased to more than twice the theoretical turbulent value for zero angle of attack. (Author)

AD-256 080 Div. 9, 1
(18 May 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
TRANSONIC INVESTIGATION OF AERODYNAMIC CHARACTERISTICS OF A SWEPT-WING FIGHTER-AIRPLANE MODEL

WITH LEADING-EDGE DROOP IN COMBINATION WITH OUTBOARD CHORD-EXTENSIONS AND NOTCHES,
by Charles F. Whitcomb and Harry T. Morton, Jr. May 61, 30p. incl. illus. table, 12 refs. (Technical note D-834, Supersedes NACA Research Memo. L55H30, AD-89 934)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-834.

DESCRIPTORS: *Transonics, *Fighters, Drag, Model tests, *Stability (Longitudinal), Lift, *Swept wings, Aerodynamic configurations, Airplane models, Transonic wind tunnels, Tests, Wind tunnel models.

The investigation of the 45 degrees swept-wing model was conducted to determine the effects of wing leading-edge droop in combination with outboard chord-extensions and notches on the longitudinal stability and performance characteristics. Comparison with results for a configuration with leading-edge slats is included. These devices provided only slight improvement of the longitudinal stability characteristics but substantially decreased the airplane drag coefficients at moderate and high lifting conditions. (Author)

AD-256 170 Div. 9, 25, 30
(22 May 61) OTS price $2.60

General Applied Science Labs., Inc., Hempstead, N. Y.
PROPOSED INVESTIGATION OF VISCOUS-INVISCID EFFECTS IN HYPERSONIC FLOW IN THE AEDC GAS DYNAMICS FACILITY TUNNEL B-2. PHASE I.
Oct 59. 25p. incl. illus. tables. (Technical memo. no. 26)
(Contract AF 33(616)6692)
Unclassified report

DESCRIPTORS: *Gas flow, *Hypersonic flow, Hypersonic wind tunnels, Viscosity, Pressure, Heat transfer, Wind tunnel models, Conical bodies, Blunt bodies, Test facilities, Test equipment, Airplane noses, Aerodynamic configurations, Measurement, Wind tunnels, Tests.

This report includes:
NOTE ON B-2 DATA REDUCTION. SUPPLEMENT TO TM-26. Oct 59. 3p. incl. table.

A test program is presented for a series of hypersonic research tests to provide detailed data for pressure distribution and heat transfer over several model configurations. The following configurations are to be studied: (1) spherically blunted cone instrumented for pressure distribution; (2) spherically blunted cone instrumented for heat transfer measurement; (3) 2-dimensional flat plate with 0.1-in. leading edge radius instrumented for simultaneous measurement of pressure and heat transfer on windward surface; (4) 2-dimensional flat plate with 0.5-in. leading edge radius instrumented for pressure and heat transfer measurement on windward surface and in the vicinity of the nose region; and (5) 2-dimensional flat plate with 0.5-in. leading edge radius with planes tangent to body at sonic point and tangent (S/R) equal to 1.22 instrumented for pressure and heat transfer on upper and lower surfaces.

AD-256 171 Div. 9, 25, 30
(22 May 61) OTS price $1.60

General Applied Science Labs., Inc., Hempstead, N. Y.
PROPOSED WIND TUNNEL INVESTIGATION OF VARIOUS HYPERSONIC CONFIGURATIONS TO BE CONDUCTED IN THE AEDC GAS DYNAMICS FACILITY TUNNEL HS-2.
Oct 59. 11p. incl. tables. (Technical memo. no. 27)
(Contract AF 33(616)6692)
Unclassified report

DESCRIPTORS: Aerodynamic configurations, Hypersonic flow, *Hypersonic wind tunnels, Gas flow, *Heat transfer, *Pressure, Measurement, Tables, Wind tunnel models, Conical bodies, Triangular wings, Wind tunnels, Tests.

The pretest requirements of the AEDC Gas Dynamics Facility are outlined and summarized. Tests are to be conducted to obtain useful heat transfer and pressure distributions on hypersonic models which include conical bodies, flat plates, and delta wings.

AD-256 172 Div. 9, 25, 30
(22 May 61) OTS price $3.60

General Applied Science Labs., Inc., Westbury, N. Y.
PROPOSED INVESTIGATION OF VISCOUS-INVISCID EFFECTS IN HYPERSONIC FLOW IN THE AEDC GAS DYNAMICS FACILITY TUNNEL B. PHASE II.
28 Mar 60. 30p. incl. illus. tables. (Technical memo. no. 32A)
(Contract AF 33(616)6692)
Unclassified report

DESCRIPTORS: *Gas flow, *Hypersonic flow, Hypersonic wind tunnels, Viscosity, Pressure, Heat transfer, Aerodynamic configurations, Measurement, Test facilities, Test equipment, *Triangular wings, Thermocouples, Tables, Wind tunnels, Tests.

A test program is presented for a series of hypersonic research tests to provide detailed data for pressure distribution and heat transfer over several model configurations. The model configurations include delta planforms 70 degrees lambda 0 degrees dihedral, 70 degrees lambda 10 degrees cathedal, 70 degrees lambda 10 degrees dihedral, 60 degrees lambda 0 degrees dihedral, 75 degrees lambda 0 degrees dihedral, fin-flat plate interference (90 degrees Fin), and 45 degrees fin-flat plate interference.

AD-256 173 Div. 9, 25, 30
(22 May 61) OTS price $1.10

General Applied Science Labs., Inc., Westbury, N. Y.
LAMINAR HEAT TRANSFER DISTRIBUTION ABOUT TWO-DIMENSIONAL AND AXIALLY-SYMMETRIC BODIES,
by Victor Zakkay. 12 July 60. 2p. (Technical memo. no. 35)
(Contract AF 33(616)6692)
Unclassified report

DESCRIPTORS: *Heat transfer, *Axially-symmetric flow, Gas flow, Theory, Aerodynamic configurations, Equations, *Hemispherical shells, *Cylindrical bodies, Mathematical analysis, Measurement.

The equations of Lees were integrated for an axially-symmetric body with a hemispherical nose, and for a flat body with a cylindrical nose. The results indicated that the heat transfer distributions, when non-dimensionalized with respect to the stagnation point, for a given pres-

sure distribution, differ by the order of 3%. The calculations were also made for a flat nosed axially-symmetric body and a flat nosed plate; the heat distributions agreed very well with each other. Since the heat transfer about a 3-dimensional body lies between that of an equivalent 2-dimensional and a similar axially-symmetric body, it is concluded that this distribution may be obtained from the 2-dimensional analysis. (Author)

AD-256 174 Div. 9, 25, 30
(22 May 61) OTS price $3.60

General Applied Science Labs., Inc., Westbury, N. Y.
PRESSURE DISTRIBUTION ON A BLUNTED 15 DEGREES CIRCULAR CONE.
Feb 60. 35p. incl. illus. tables, 11 refs. (Technical rept. no. 136; Data rept. no. 5134-1)
(Contract AF 33(616)6692)
Unclassified report

DESCRIPTORS: *Conical bodies, *Pressure, *Blunt bodies, Measurement, Hypersonic flow, Hypersonic wind tunnels, Theory, Wind tunnel models, Reynolds number, Aerodynamic configurations, Gas flow, Wind tunnels, Tests.

Results are presented for an experimental wind tunnel investigation conducted at Mach 8. The effect of angle of attack and of Reynolds number variation on the pressure distribution on a blunted 15 degree semi-vortex angle right circular cone of 0.40-in. nose radius and 10.75-in. length is considered. Axial and peripheral pressure distributions are presented. Several existing theories are included and comparisons are made between them and experimental results. (Author)

AD-256 175 Div. 9
(22 May 61) OTS price $2.60.

General Applied Science Labs., Inc., Westbury, N. Y.
REGIMES OF CONTINUUM FLOW FOR BODIES OF SIMPLE GEOMETRY WITH APPLICATION TO HYPERSONIC GLIDE VEHICLES,
by Paul A. Libby. Mar 60, 1v. incl. illus.
(Technical rept. no. 152)
(Contract AF 33(616)6692)
Unclassified report

DESCRIPTORS: Boundary layer, *Hypersonics, Aerodynamics, *Cylindrical bodies, *Bodies of revolution, Wings, *Hypervelocity vehicles, Shock waves, Viscosity, *Blunt bodies, *Spheres.

In this memorandum the problem of interaction between the essentially inviscid flow and the boundary layer on bodies of simple geometry is considered. There is discussed first the interaction at the leading edge of an unswept cylinder as the Reynolds number based on the cylinder radius is decreased. The requirements for a plate with a cylindrical leading edge to be considered sharp are then reviewed. The interaction which can occur far downstream of the nose is also discussed. The same concepts are applied to a spherical nose and to swept cylinders. The velocity-altitude regimes which result from these considerations applied to two nose radii, 0.1 and 1 ft, are then compared to flight paths for lightly loaded hypersonic glide vehicles. It is shown that for these vehicles the leading edge flow phenomena are characterized by blunt edge effects and must therefore be studied in terms of first-order corrections to the classical boundary layer theory and in terms of viscous shock layers.

AD-256 176 Div. 9
(22 May 61) OTS price $7.60

General Applied Science Labs., Inc., Westbury, N. Y.
EXPERIMENTAL LAMINAR HEAT TRANSFER DISTRIBUTION ON A BLUNTED 15 DEG CIRCULAR CONE AT ANGLE OF ATTACK.
Mar 60, 72p. incl. illus. tables. (Technical rept. no. 153; Data rept. no. 5134-2)
(Contract AF 33(616)6692)
Unclassified report

DESCRIPTORS: *Heat transfer, Aerodynamics, *Conical bodies, *Blunt bodies, Bodies of revolution, Supersonics, Hypersonics, Laminar boundary layer, Boundary layer, Model tests, Aerodynamic configurations, Mathematical analysis,

The heat transfer on a 15 degree half-angle blunted cone at angle of attack and Mach number 8 was investigated experimentally. The results were found to agree well with similar data. Heat transfer results are presented for points along the most windward ray, the most leeward ray, and the lateral ray of the cone for several angles of attack. Several theories for predicting the heat transfer along the most windward ray of the cone are evaluated and compared with the experimental data. Theoretical methods and approximations for the axial heat transfer distribution were applied to evaluate an empirical relation for the peripheral heat transfer distribution. These results were then compared with the experimentally determined results and it was found that on the conical portion of the body reasonable engineering agreement with experiment has been obtained.

AD-256 177 Div. 9
(22 May 61) OTS price $1.60

General Applied Science Labs., Inc., Westbury, N. Y.
LAMINAR HEAT TRANSFER TO THE MOST WINDWARD RAY OF A 15 DEGREE SPHERICALLY BLUNTED CONE AT ANGLE OF ATTACK.
Apr 60, 18p. incl. illus. table. (Technical rept. no. 157; Data rept. no. 5134-3)
(Contract AF 33(616)6692)
Unclassified report

DESCRIPTORS: *Heat transfer, Aerodynamics, *Conical bodies, *Blunt bodies, Supersonics, Bodies of revolution, Mathematical analysis, *Hypersonics, Laminar boundary layer, Boundary layer.

For the case of a spherically blunted 15 degree half angle cone, it was shown that quite satisfactory prediction of the heat transfer to the most windward ray of the cone at angle of attack may be obtained using approximate form of the solution for the heat transfer to the stagnation line of a yawed cylinder. For the body considered, the applicability of the approximation extends from (a) equal 5 degrees to (a) equal 50 degrees. At zero angle of attack, the approximation may be improved by using the local values of the surface pressure.

Division 9 - FLUID MECHANICS

AD-256 178 Div. 9, 25, 30
(22 May 61) OTS price $6.60

General Applied Science Labs., Inc., Westbury, N. Y.
PRESSURE DISTRIBUTION ON BLUNTED FLAT PLATES WITH SURFACE INCLINATION,
by A. Martellucci and A. Fields. June 60. 69p. incl. illus. tables, 10 refs. (Technical rept. no. 171; Data rept. no. 5134-5)
(Contract AF 33(616)6692)

Unclassified report

DESCRIPTORS: *Blunt bodies, Pressure, Heat transfer, Measurement, Hypersonic wind tunnels, Hypersonic flow, Wind tunnel models, Surface properties, Reynolds number, Theory, Mathematical analysis, Cylindrical bodies, Aerodynamic configurations, Spark shadowgraph photography, Wind tunnels, Tests.

Surface pressures and heat transfer were measured on 2 flat plates blunted by a semi-cylindrical leading edge at a nominal Mach number of 8. The nose radii of the 2 models were 0.10 and 0.50 inches. Both models had a chord length of 11.0 inches. The effects of angle of attack, Reynolds number, and nose radii on the surface pressure distribution were considered. Tests were conducted over a range of 0 to 30 degrees surface inclination. The free stream Reynolds number varied from 0.43 to 2.00.x 10 to the 6th power per foot. Several existing theories are presented and comparisons are made with experimental data. Shadowgraphs of the flow about each model are included for several angles of attack.

AD-256 179 Div. 9
(22 May 61) OTS price $2.60.

General Applied Science Labs., Inc., Westbury, N. Y.
A TECHNIQUE FOR COMPUTING THREE-DIMENSIONAL STEADY INVISCID SUPERSONIC FLOWS,
by Gino Moretti. 11 July 60, 28p. incl. illus. (Technical rept. no. 172)
(Contract AF 33(616)6692)

Unclassified report

DESCRIPTORS: Mathematical analysis, Gas flow, *Supersonics, *Aerodynamics, Shock waves, Numerical methods and procedures, *Supersonic flow,

A thorough understanding of the supersonic flow past an arbitrarily shaped body can only be achieved by solving the three-dimensional aerodynamic problem. It is well known that only numerical techniques can be used, because of the nonlinearity of the equations. Nevertheless, in the field of engineering, a quick, panoramic survey of a problem is often much more interesting and useful than the exact solution on one particular case. With this in mind, we attempted the building up of a technique to be used on a small computing machine. Its advantages are: the simplicity of the program, which can be understood and eventually modified by engineers, not specially skilled in programming; a direct control of the results, as far as they are typed out; the choice of different degrees of approximation, including a very rough one, apt for getting a first insight on a given body under several conditions, and seeing how it works. In this report, the essential features of the problem are first examined to obtain suggestions for setting up a technique, and then the numerical procedure which has been set up and programmed is outlined.

AD-256 180 Div. 9
(22 May 61) OTS price $1.60

General Applied Science Labs., Inc., Westbury, N. Y.
PRELIMINARY REPORT ON THE FIN-WING INTERACTION PROBLEM,
by Lu Ting and Paul A. Libby. July 60. 11p. incl. illus. (Technical rept. no. 175)
(Contract AF 33(616)6692)

Unclassified report

DESCRIPTORS: *Shock waves, Boundary layer, *Laminar boundary layer, *Fins, *Wings, Supersonics, Mathematical analysis, *Hypersonics, Aerodynamics.

An idealization of the shock wave boundary layer interaction problem which arises when a fin is installed on a wing or planar surface is described. It is shown that a reasonable first step in the analysis of this interaction is the two-dimensional interaction of an oblique shock wave on a laminar boundary layer. In view of recent developments in boundary layer theory an analysis of this problem seems possible. Accordingly a flow model and method of analysis are outlined and the next steps in the investigation described.

AD-256 181 Div. 9
(22 May 61) OTS price $3.60

General Applied Science Labs., Inc., Westbury, N. Y.
HYPERSONIC LAMINAR HEAT TRANSFER TO CYLINDRICALLY BLUNTED FLAT PLATES AT ANGLE OF ATTACK,
by Ernest A. Sanlorenzo. 5 July 60, 31p. incl. illus. table. (Technical rept. no. 176; Data rept. no. 5134-6)
(Contract AF 33(616)6692)

Unclassified report

DESCRIPTORS: *Hypersonics, Boundary layer, *Laminar boundary layer, *Blunt bodies, Aerodynamics, *Heat transfer, Model tests, Aerodynamic configurations, Wings, *Supersonic airfoils,

The objective of this report is to present heat transfer results obtained at M equals 8 in Tunnel B of the von Karman Gas Dynamics Facility, Arnold Engineering Development Center. In addition, theoretical analyses with respect to these results, as performed to date, are presented.

AD-256 182 Div. 9
(22 May 61) OTS price $2.60

General Applied Science Labs., Inc., Westbury, N. Y.
METHOD FOR PREDICTION OF STREAMLINES AND HEAT TRANSFER TO BODIES IN HYPERSONIC FLOW,
by Ernest A. Sanlorenzo. 11 July 60, 25p. incl. illus. (Technical rept. no. 177)
(Contract AF 33(616)6692)

Unclassified report

DESCRIPTORS: *Heat transfer, *Hypersonics, Aerodynamics, Mathematical analysis, Model tests, *Bodies of revolution, *Conical bodies, *Blunt bodies, Triangular wings, Aerodynamic configurations.

The requirement of this contract is the investigation of methods for the prediction of heat transfer to typical hypersonic configurations.

In support of this work extensive pressure and heat transfer measurements have been made in the hypersonic facilities at Arnold Engineering Development Center, Tullahoma, Tennessee. The experimental effort was divided into two phases. During the first phase, very basic geometries were investigated which included a spherically blunted cone. In the second phase, various delta wing configurations were tested. These configurations considered the effect of leading edge sweep, dihedral, and cathedral. The work reported herein is the result of a general heat transfer analysis as applied to the first phase experimental results, and in particular, to the spherically blunted cone.

AD-256 183 Div. 9
(22 May 61) OTS price $4.60.

General Applied Science Labs., Inc., Westbury, N. Y.
SUPERSONIC FLOW ABOUT TWO-DIMENSIONAL ASYMMETRIC BLUNT BODIES,
by Roberto Vaglio-Laurin. July 60, 43p. incl. illus. (Technical rept. no. 178, pt. 1)
(Contract AF 33(616)6692)
Unclassified report

DESCRIPTORS: *Blunt bodies, *Supersonics, Aerodynamics, Mathematical analysis, Airfoils, *Perturbation theory, *Supersonic airfoils, Aerodynamic configurations, Hypersonics, Pressure, Shock waves,

In Part I, it is shown that application of the Dorodnitsyn-Belotserkovskii (DB) method can be greatly expedited and simplified by introducing a linearization process and a simultaneous stretching of coordinates in the spirit of the Poincare-Lighthill-Kuo method. The approach eliminates cumbersome iteration previously required by the DB method and standardizes the determination of: (a) successive approximations, and (b) effects of changes in free stream Mach number and body profile for a given approximation. Details of analysis and procedure are presented in connection with the first approximation of the DB method; the extension to subsequent approximations and to axisymmetric problems is outlined. In Part II, a comparison between theory and experiment is instituted for a two-dimensional asymmetric configuration tested in air (gamma equals 1.4) at Mach 8; predicted pressure distributions and shock shapes are in good agreement with measurements. (Author)

AD-256 184 Div. 9
(22 May 61) OTS price $1.10.

General Applied Science Labs., Inc., Westbury, N. Y.
SUPERSONIC FLOW ABOUT TWO-DIMENSIONAL ASYMMETRIC BLUNT BODIES,
by Roberto Vaglio-Laurin. July 60, 8p. incl. illus. (Technical rept. no. 178, pt. 2)
(Contract AF 33(616)6692)
Unclassified report

DESCRIPTORS: Supersonics, *Blunt bodies, Aerodynamics, Mathematical analysis, Perturbation theory, *Supersonic airfoils, Airfoils, Aerodynamic configurations, Pressure, *Hypersonics, Shock waves,

In Part I (AD 256 183), it is shown that application of the Dorodnitsyn-Belotserkovskii (DB) method can be greatly expedited and simplified by introducing a linearization process and a simultaneous stretching of coordinates in the spirit of the Poincare-Lighthill-Kuo method. The approach eliminates cumbersome iteration previously required by the DB method and standardizes the determination of: (a) successive approximations, (b) effects of changes in free stream Mach number and body profile for a given approximation. Details of analysis and procedure are presented in connection with the first approximation of the DB method; the extension to subsequent approximations and to axisymmetric problems is outlined. In Part II, a comparison between theory and experiment is instituted for a two-dimensional asymmetric configuration tested in air (gamma equals 1.4) at Mach equals 8; predicted pressure distributions and shock shapes are in good agreement with measurements.

AD-256 185 Div. 9
(22 May 61) OTS price $4.60

General Applied Science Labs., Inc., Westbury, N. Y.
HEAT TRANSFER AND PRESSURE DISTRIBUTION ON A TWO-DIMENSIONAL BLUNTED ASYMMETRIC BODY,
by Mitchell Seidman. Dec 60. 49p. incl. illus. tables. (Technical rept. no. 204)
(Contract AF 33(616)6692)
Unclassified report

DESCRIPTORS: *Heat transfer, Pressure, Supersonics, *Hypersonics, Aerodynamics, *Supersonic airfoils, Airfoils, Aerodynamic configurations, Model tests, *Blunt bodies.

Heat transfer and pressure distributions have been obtained on a two-dimensional symmetric body designed to reduce heat transfer rates at the stagnation point. Theoretical and experimental pressure distributions indicate a large reduction in velocity gradients at the stagnation point. Experimental heat transfer results at the high angles of attack (a equals 30 degrees) indicate a 15 - 20% reduction from the two-dimensional stagnation point heat transfer. Further investigation at the higher angles of attack is desirable in order to fully evaluate the capabilities of such shapes.

AD-256 186 Div. 9
(22 May 61) OTS price $9.10

General Applied Science Labs., Inc., Westbury, N. Y.
GENERAL DESCRIPTION OF IBM 704 COMPUTER PROGRAMS FOR FLOW FIELD ABOUT BLUNT-NOSED BODIES OF REVOLUTION IN HYPERSONIC FLIGHT,
by Edward Lieberman. Mar 61, 97p. incl. illus. (Technical rept. no. 208)
(Contract AF 33(616)6692)
Unclassified report

DESCRIPTORS: *Digital computers, *Hypersonics, Aerodynamics, *Blunt bodies, *Bodies of revolution, Mathematical analysis, Vibration, *Programming, Shock waves, Hypersonic flow, Axially symmetric flow.

The scope of these programs is to generate the flow field about blunt-nosed axisymmetric bodies of revolution in hypersonic flight, including the effect of gas dissociation and vibrational excitation. The flow field about the subject category of bodies includes a subsonic and a supersonic portion. The calculations proceed by an

inverse method (prescribed shock) in the subsonic region, and by characteristic procedures in the supersonic region. For a given body shape, the subsonic region is determined first by iteration; the numerical analysis is then continued in the supersonic region for the prescribed body shape. The equations which constitute the analysis which has been programmed, are included for descriptive purposes.

AD-256 187 Div. 9
(22 May 61) OTS price $5.60

General Applied Science Labs., Inc., Westbury, N. Y.
DIGITAL PROGRAMS FOR CALCULATING THE PRESSURE DISTRIBUTION OVER TWO-DIMENSIONAL BODIES AND THE DETERMINATION OF STREAMLINES AND HEAT TRANSFER COEFFICIENTS FOR BLUNTED CONES AT ANGLE OF ATTACK, by Gertrude Weilerstein and Jay Hoffman. Mar 61, 51p. incl. illus. tables (Technical rept. no. 209)
(Contract AF 33(616)6692)
Unclassified report

DESCRIPTORS: *Digital computers, Programming, Mathematical analysis, Aerodynamics, *Hypersonics, *Blunt bodies, *Bodies of revolution, *Conical bodies, Heat transfer, Pressure.

A digital program for calculating pressures along a two-dimensional body is described. The program is written for use with the IBM 7090 Fortran monitoring system. Local, asymptotic, blast wave and viscous pressures are calculated at i stations along the body using a modified Creager - Blast Wave Analysis. For each body the angle of attack can be varied over 20 different values and the free stream conditions can be varied over 50 different sets of values. A digital program is also described which permits an engineering analysis of the laminar heat transfer on a spherically blunted cone at angle of attack for hypersonic flight speeds. As part of the analysis, the surface streamlines on the cone are generated. The program is written assuming an ideal gas.

AD-256 211 Div. 9, 12, 24
(18 May 61) OTS price $1.60

Space Technology Labs., Inc., Los Angeles, Calif.
LIQUID-GAS INTERFACE IN ZERO-G, by L. van der Wal. Semiannual rept., 1 July-31 Dec 60. 31 Dec 60, 12p. incl. illus. table. (Rept. no. STL/TR-60-0000-19229)
(Contract AF 04(647)619)
(AFBMD TN 61-8)
Unclassified report

DESCRIPTORS: Liquids, Gases, *Mixtures, *Weightlessness, Photographic equipment, Tests, Temperature, Pressure, Photographic recording systems, *Space environmental conditions, Astrophysics.

An account is given of the progress made in an investigation of the behavior of a liquid-gas mixture in a zero-g field. An experiment unit was flown on an Atlas re-entry nosecone test vehicle. The experiment unit housed a movie camera, placed so as to observe and record the interaction of gas and water contained in a plastic cube during the 25-minute near-zero-g conditions present on an ICBM flight. Temperature and pressure changes were also recorded. Although the flight met most of the vehicle test objectives, the nosecone was not recovered from the ocean as planned. Consequently the film data from the zero-g experiment were lost and only the telemetered data were available for analysis. (Author)

AD-256 234 Div. 9
(18 May 611) OTS price $9.60

Michigan U., Ann Arbor.
EFFECTS OF COOLING ON TRANSITION IN THE BOUNDARY LAYER ON A HEMISPHERE IN SIMULATED HYPERSONIC FLOW, by Roger Dunlap and A. M. Kuethe. Rept. on Aerodynamic Flow Field. Feb 61, 104p. incl. illus. 50 refs.
(Contract AF 33(616)6856, Proj. 7064)
(ARL-15)
Unclassified report

DESCRIPTORS: *Boundary layer, Turbulent boundary layer, Laminar boundary layer, Temperature, Model tests, Bodies of revolution, *Blunt bodies, *Turbulence, *Hypersonic flow, Pressure, Velocity, Heat transfer, Mathematical analysis, *Cooling, Aerodynamics.

A study was made to investigate the effects of cooling on transition in the boundary layer on the nose of a 9-inch diameter hemisphere in simulated hypersonic flow, with the aim of gaining some knowledge of the circumstances under which boundary-layer cooling may promote a reduction in transition Reynolds number (transition reversal). The influences of cooling in increasing the stability to Tollmien-Schlichting type disturbances, in decreasing any stabilizing effects of convex curvature, and in increasing the magnitude of disturbances from fixed roughness elements, are discussed. (Author)

AD-256 239 Div. 9
(19 May 61) OTS price $4.60

Stanford U., Calif.
CALCULATIONS OF THE ONE-DIMENSIONAL NONEQUILIBRIUM FLOW OF AIR THROUGH A HYPERSONIC NOZZLE, by Walter G. Vincenti. Interim rept. May 61, 41p. incl. illus. tables, 25 refs.
(Contract AF 40(600)731)
(AEDC TN 61-65)
Unclassified report

DESCRIPTORS: Equations, *Hypersonic nozzles, *Wind tunnel nozzles, *Hypersonic flow, Gas flow, *Hypersonics, Chemical reactions, Digital computers, Mathematical analysis, Supersonic wind tunnels, Differential equations, Mixtures, Oxygen, Nitrogen.

A method is described for numerical calculation of the one-dimensional nonequilibrium flow of a nitrogen-oxygen mixture through a converging-diverging nozzle. First, the general equations are set down for a mixture of perfect gases with an arbitrary number of species undergoing an arbitrary number of chemical and vibrational rate processes. The method of calculation is then described, including a perturbation process used to obtain the required initial conditions for the nonequilibrium computations. Specific calculations, carried out on an IBM 709 computer, are then reported for an air model consisting of O2, O, N2, N and NO and including eight chemical reactions plus the vibrational processes of three diatomic species. The results, which are for flow through a specific wind-tunnel nozzle at reservoir conditions of 7,950 K and 35 atmospheres density, demonstrate the feasibility of

the method. They are limited in extent, however, by the excessive computing time entailed by the extremely small step size required to keep the integration process from diverging. (Author)

AD-256 274 Div. 9
(19 May 61) OTS price $3.60

Michigan State U., East Lansing.
EXPERIMENTAL AND ANALYTICAL STUDY OF THE INFLUENCE OF ENTRANCE ANGLE IN VORTEX-SEPARATION FLOW,
by J. E. Lay and B. C. Lee. Final rept. 20 Apr 61, 28p. incl. illus. 31 refs.
(Contract DA 20-018-ORD-17971, Proj. TB2-0001 (2093))
Unclassified report

DESCRIPTORS: *Vortices, *Aerodynamics, Mathematical analysis, *Hilsch tubes, Model tests, *Compressible flow, *Turbulent flow, Viscosity.

The influence of the entrance angle in relation to the Ranque-Hilsch effect is summarized. This is one aspect of the phenomenon which has not, heretofore, been extensively discussed in the literature of the vortex tube. The experimental study reports on pressure, temperature, and velocity distributions in a vortex tube for entrance angles of 90 degrees (tangential flow), 75 degrees, 60 degrees, 45 degrees, 30 degrees, and 15 degrees (near axial flow). The analytical study starts with the Navier-Stokes equations for compressible viscous flow and the continuity equation. These are expressed in cylindrical coordinates and solved for the case of axisymmetric turbulent flow using Gauss' divergence theorem to express the circulation. The results, along with the experimental findings, indicate that the circulation, and therefore the entrance angle is an important parameter of performance. The close resemblance between analytical curves and experimental curves serves to bring out the essential features of the Ranque-Hilsch effect in relation to the entrance flow angle. (Author)

AD-256 328 Div. 9, 22, 30
(22 May 61) OTS price $3.60

Aeronutronic, Newport Beach, Calif.
APPLICATION OF FINITE DIFFERENCE METHODS TO PROBLEMS IN TWO-DIMENSIONAL HYDRODYNAMICS,
by R. Grandey. Summary rept. 26 Jan 61, 29p. incl. illus. (Publication no. U-1130)
(Contract DA 04-495-ORD-3095, Proj. TS1-200)
Unclassified report

DESCRIPTORS: *Scientific research, *Fluid mechanics, Difference equations, Shock waves, *Digital computers, *Programming, *Hydrodynamics, *Warheads, Numerical methods and procedures, Design, Blast.

Research was concerned with the development of a two-dimensional hydrodynamics computation program on the IBM 709 computer for use in the analysis of non-nuclear warhead design problems. The program, which employs a Lagrangean, triangular mesh, was modified to be compatible with the IBM 709 and associated peripheral equipment. The early expansion of the case of a 105 mm shell was studied. The computer program was rewritten to allow different time intervals in different parts of the spatial mesh. (Author)

AD-256 347 Div. 9, 27
(22 May 61) OTS price $4.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
PERFORMANCE SUMMARY OF THE SUPERSONIC DIFFUSER AND ITS APPLICATION TO ALTITUDE TESTING OF CAPTIVE ROCKET ENGINES,
by Richard H. Nickola. Apr 61, 42p. incl. illus. tables, 21 refs. (Add. no. 1 to Rept. no. AFFTC TR 60-1, AD-233 482)
Unclassified report

DESCRIPTORS: *Supersonic diffusers, Tests, Supersonic nozzles, *Rocket motors, Altitude chambers, Supersonic flow, Solid rocket propellants, High altitude, Test facilities, Design, Simulation.

The final results are presented of a development program, initiated to determine the altitude simulation produced by various second and third stage rocket engines enclosed in an altitude chamber and fired into a constant cross-sectional area diffuser. The diffuser and supersonic nozzle configurations were tested utilizing nitrogen gas as the primary fluid; and also with 1000 pound thrust solid propellant rocket engines. The experimental results are in accord with the one dimensional equations describing part of the diffuser performance curve and establish a criteria for comparison with the results obtained from the 1000 pound thrust solid propellant rockets. The resulting data presents a method of diffuser application for captive rocket engine testing at altitudes in excess of 100,000 feet. The minimum altitude chamber pressure produced with a solid propellant 15 degree conical Mach 4 configuration was .008 atmospheres while the minimum altitude chamber pressure produced in the nitrogen gas tests was .006 atmospheres with a slowly diverging Mach 4 configuration. (Author)

AD-256 507 Div. 9
(24 May 61) OTS price $2.75

National Aeronautics and Space Administration, Washington, D. C.
TRANSONIC LOADS CHARACTERISTICS OF A 3-PERCENT-THICK 60 DEGREES DELTA-WING-BODY COMBINATION,
by John M. Swihart and Willard E. Foss, Jr. May 61, 127p. incl. illus. tables, 19 refs.
(NASA Technical note D-830; Supersedes RM-L57D12, AD-13 697)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note 830.

DESCRIPTORS: *Triangular wings, Wind tunnel models, Wing-body configurations, *Load distribution, *Transonics, Model tests, Transonic wind tunnels, Pressure, Transonic flow.

An investigation has been made in the Langley 16-foot transonic tunnel to determine the aerodynamic loading characteristics of a 3-percent-thick, aspect-ratio-2.06, 60 degree delta-wing-body combination. The Mach number range was from 0.80 to 1.05 and the average Reynolds number based on wing mean aerodynamic chord was 10 x 10 to the 6th power. The angle-of-attack range was from 0 degrees to 26 degrees but was limited at the highest Mach numbers by tunnel drive power. Pressure distributions, spanwise loadings, integrated wing coefficients, and tabulated pressure coefficients are presented for the range of Mach numbers and angles of at-

tack. The results indicate that a free leading-edge separation vortex is the dominant flow-field phenomenon at all Mach numbers and that, consequently, there are only slight changes in the spanwise loadings with Mach number. There is a slight outboard shift in center of pressure with an increase in Mach number. The chordwise position of the center of pressure varies from 46 to 55 percent of the mean aerodynamic chord when the Mach number is increased from 0.80 to 1.05. (Author)

AD-256 508 Div. 9
(23 May 61) OTS price $ .75

National Aeronautics and Space Administration, Washington, D. C.
A STUDY OF FLUTTER AT LOW MASS RATIOS WITH POSSIBLE APPLICATION TO HYDROFOILS,
by Robert W. Herr. May 61. 28p. incl. illus. table. (NASA Technical note D-831)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-831.

DESCRIPTORS: *Hydrofoils, *Hydrodynamics, Water tunnels, *Flutter, Cantilever beams, Model tests, Stability, *Fluid mechanics, Pressure, Damping, Tests, Swept-back wings, Stresses, Load distribution, Wings.

Experimental flutter-test results for some flexible cantilever-wing models partly submerged in water are presented. The results tend to corroborate theoretical predictions of a stable region at low ratios of structural mass to fluid mass. Theoretical studies indicate this dynamic stability to be closely associated with the presence of fluid damping forces. An explicit expression is presented which defines the lowest mass ratios for which representative section (flexure-torsion) flutter solutions are obtainable as a function of the various structural parameters. Classical flutter of hydrofoils is possible, especially for heavy sections with the center of gravity located far aft. Theoretical indications are that the flutter boundary at low mass ratios is very sensitive to small differences in the various theories. Inclusion of sweep in a modal analysis resulted in flutter solutions in the low mass-ratio range where none had previously been obtained. (Author)

AD-256 515 Div. 9, 1
(24 May 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
LOW-SPEED INVESTIGATION OF THE EFFECTS OF FREQUENCY AND AMPLITUDE OF OSCILLATION IN SIDESLIP ON THE LATERAL STABILITY DERIVATIVES OF A 60 DEGREE DELTA WING, A 45 DEGREE SWEPTBACK WING, AND AN UNSWEPT WING,
by Jacob H. Lichtenstein and James L. Williams. May 61, 19p. incl. illus. table. (NASA Technical note D-896; Supersedes NACA Research memo. L58B26, AD-159 630)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-896.

DESCRIPTORS: *Oscillation, *Stability (Lateral), *Swept back wings, *Triangular wings, *Wings, Frequency, Aerodynamic configurations.

This investigation was made for values of the reduced-frequency parameter of 0.066 and 0.218 and for a range of amplitudes from plus or minus 2 degrees to plus or minus 6 degrees. The results indicated that the effect of frequency manifests itself mainly in the high angle-of-attack region and that the 60 degree delta wing exhibited the largest effect, whereas the unswept wing exhibited the smallest effect. (Author)

AD-256 745 Div. 9, 25
(31 May 61) OTS price $1.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
HYPERSONIC SHOCK-LAYER THEORY OF THE STAGNATION REGION AT LOW REYNOLDS NUMBER,
by H. K. Cheng. Apr 61, 15p. incl. illus. (Rept. no. AF-1285-A-7)
(Contracts Nonr-265300 and AF 30(602)2267)
Unclassified report

DESCRIPTORS: Hypersonics, Reynolds number, *Shock waves, Theory, *Boundary layer, *Hypersonic flow, *Superaerodynamics, *Heat transfer, Vortices, Viscosity, Mathematical analysis, Surfaces, Cooling.

Hypersonic flow at low Reynolds number is studied utilizing the shock-layer concept. The present formulation takes into account the salient features of the transport processes within the shock layer in a manner consistent with the shock-layer approximation. The Rankine-Hugoniot shock relations are modified to include contributions due to heat conduction and viscous effects immediately behind the shock. The specific problem of an axisymmetric stagnation region is treated. The flow regimes for this problem can be classified according to whether or not the transport effects are important immediately behind the shock. In one regime where the ordinary Rankine-Hugoniot relations hold across the shock, the vorticity-interaction theory based on the boundary-layer approximation is shown to be sufficient. In the other regime where the Rankine-Hugoniot relations have to be modified but the continuum-flow model applies, an approximate, analytical solution is obtained. The present study is intended to provide an understanding to bridge the gap between the free-molecule flow regime and that of the boundary layer via the continuum theory. In this respect, the solution obtained appears to be satisfactory in that it yields the correct free-molecule limits for the skin friction and surface-heat transfer rate. (Author)

AD-256 771 Div. 9
(31 May 61) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
PRESSURE LOADS PRODUCED ON A FLAT-PLATE WING BY ROCKET JETS EXHAUSTING IN A SPANWISE DIRECTION BELOW THE WING AND PERPENDICULAR TO A FREE-STREAM FLOW OF MACH NUMBER 2.0,
by Ralph A. Falanga and Joseph J. Janos. May 61, 47p. incl. illus. tables (NASA Technical note no. D-893; supersedes NACA RM L58D09, AD-159 628)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA TN D-893.

DESCRIPTORS: Pressure, Load distribution, *Wings, Supersonics, Aerodynamics, *Jet mixing flow, *Rocket motors, Model tests, Exhaust gases, Reynolds number.

The variables involved in this investigation were nozzle configuration, nozzle position beneath the wing, and pressure ratio. The design procedure for the rockets used is given in the appendix. The incremental normal force due to jet interference on the wing varied from one to two times the rocket thrust and generally decreased as the pressure ratio increased. (Author)

AD-256 777 Div. 9, 15
(29 May 61) OTS price $2.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
CALCULATION OF THE RADIAL DISTRIBUTION OF THE DENSITY DEPENDENT PROPERTIES IN AN AXISYMMETRIC GAS STREAM,
by M. T. Dooley and W. K. McGregor. May 61, 30p. incl. illus. (AEDC TN 60-216)
(Contract AF 40(600)800)
Unclassified report

DESCRIPTORS: *Gas flow, Plasma jets, *Jets, Numerical methods and procedures, Density, Mathematical analysis, Digital computers, Integral equations, *Axially symmetric flow, Equations.

An analytical method of determining the radial distribution of the density dependent properties in an axisymmetric gas stream is presented. This method is used to invert the integrated lateral intensity distribution of properties which are normally obtained with experimental techniques to the desired local radial variation. The equation of lateral distribution is derived, and the analytical solution for the radial distribution equation is shown. A numerical solution ideally suited to high speed digital computers is presented. A particular application, determination of the radial distribution of spectral radiant emission from a plasma jet, is described; a discussion of the shapes of the measured and inverted distribution is included. (Author)

AD-256 779 Div. 9, 12
(29 May 61) OTS price $2.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
TESTS OF THE KAMAN KRC-6M ROTOCHUTE AT TRANSONIC SPEEDS,
by R. D. Herron and T. W. Binion, Jr. May 61, 27p. incl. illus. tables. (AEDC TN 61-60)
(Contract AF 40(600)800)
Unclassified report

DESCRIPTORS: *Rotorchutes, Moments, *Deceleration, Transonics, Tests, *Re-entry aerodynamics, Simulation, Wind tunnel models, Rotor blades, Speed regulators, Space flight, Aerodynamics.

Force and moment data, governing loads, and deployment characteristics were obtained on the Kaman KRC-6M Rotochute. Limited data were obtained to determine the effect of rotor geometry. Data were taken at Mach numbers of 0.5 to 1.5 and altitudes of 39,000 to 93,000 ft for rotor tip velocities to 530 feet per second. The Rotochute was satisfactorily deployed within three seconds under simulated flight conditions. Governing action was positive both during deployment and at steady-state test conditions. (Author)

AD-256 857 Div. 9, 1
(1 June 61) OTS price $2.60

Princeton U., N. J.
SOME NOTES ON THE P-GEM,
by T. E. Sweeney and W. B. Nixon. Jan 61, 14p. illus. (Rept. no. 537)
(Contract DA 44-177-tc-524, Proj. 9-38-01-000, TK902)
Unclassified report

DESCRIPTORS: *Ground effect, Flight testing, Shrouded propellers, Stability, Stabilization, *Aerodynamics, *Aircraft.

Certain observations are reported in a qualitative manner regarding operational and other flight experiences with the Princeton 20 ft. ground effect machine (P-GEM). Comments on the fan-inlet problem, stability and stabilizing devices, and operations over land, water and snow are made as a result of many hours of operation of the P-GEM. Tentative conclusions are drawn. (Author)

AD-256 892 Div. 9, 31
(2 June 61) OTS price $4.60

Hydronautics, Inc., Rockville, Md.
THE HYDRODYNAMIC CHARACTERISTICS OF HIGH SPEED HYDROFOILS,
by Virgil E. Johnson, Jr. and Marshall P. Tulin. Jan 61, 34p. incl. illus. tables (Technical Report no. 001-6)
(Contract Nobs-78396)
Unclassified report

Presented before the Institute of Aerospace Sciences 29th Annual Meeting, New York, N. Y. 23-25 Jan 61.

DESCRIPTORS: *Hydrofoils, *Hydrodynamics, Cavitation, Fluid flow, Load distribution, Motion, Design.

The methods used in the proper design of a hydrofoil boat or marine propeller are closely related to those used in the design of aircraft and aircraft propellers. Major factors in hydrofoil design, but which are absent in the aerodynamic case are: the influence of the near surface, cavitation, and ventilation. It is intended to acquaint the aeronautical engineer with these particular influences as they effect the design and operation of foils for marine use. The following specific subjects are discussed: the phenomena of cavitation and ventilation; design for subcavitating operation and its consequences; design for ventilated operation; supercavitating foils and their characteristics; the effects of a seaway with particular regard to motions. (Author)

10. FUELS AND COMBUSTION

AD-256 026 Div. 10, 9
(16 May 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
AN EXPERIMENTAL INVESTIGATION OF THE DAMPING OF

Division 10 - FUELS AND COMBUSTION

LIQUID OSCILLATIONS IN CYLINDRICAL TANKS WITH VARIOUS BAFFLES,
by Milton A. Silveira, David G. Stephens, and H. Wayne Leonard. May 61, 28p. incl. illus. (Technical note D-715)

Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-715.

DESCRIPTORS: Liquid rocket propellants, Configuration, *Damping, *Fuel tanks, Fluid mechanics, Cylindrical bodies, Effectiveness, Rings, Conical bodies, Propellant tanks, Tests, Oscillation.

An experimental investigation was conducted to determine the effects of baffle configuration, width, and location on the damping characteristics and frequency of the fundamental antisymmetric mode of liquid oscillations in right-circular cylindrical tanks. Baffle configurations studied include fixed rings, rings with radial clearance, cruciforms, and conic sections. For the conic-section baffles, upright, inverted, and perforated configurations were examined. Some results of studies of effects of amplitude of the liquid oscillations and kinematic viscosity on the damping are also presented. The damping results obtained in the investigation are in agreement with those predicted by available semiempirical analytical methods. (Author)

AD-256 051 Div. 10, 9, 25, 27
(17 May 61) OTS price $8.60

Pennsylvania State U., University Park.
STUDIES OF A STRATIFIED CHARGE SYSTEM. THEORETICAL AND EXPERIMENTAL INVESTIGATIONS,
by Frank Kahoun. Technical rept. May 60, 83p. incl. illus., tables, 20 refs. (Contracts DA 36-061-ORD-606 and DA 36-034-ORD-2908)

Unclassified report

DESCRIPTORS: Combustion, *Internal combustion engines, Tests, Turbulent flow, Photographic analysis, Aerodynamics, *Thermodynamics, *Gasoline, Ignition, *Gas flow, Mathematical analysis, Instrumentation, *Combustion chamber gases, *Combustion chambers, High speed photography.

A method for improving the part load economy of spark ignited gasoline engines was investigated. In this method a liquid spray is injected into a high velocity air swirl so as to have a part of the spray localize near a spark plug located in the center of the air swirl. In this way a small amount of fuel can be stratified near the spark plug to form an ignitable mixture. It was thus possible to ignite over-all lean fuel-air ratios. Research covers the investigations made with a swirl chamber designed to simulate as closely as possible, with auxiliary equipment, conditions in a gasoline engine prior to ignition. High speed photography of the spray dispersion and combustion in the swirl chamber, along with visible indication of combustion, were used to obtain most of the data. (Author)

AD-256 127 Div. 10
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE DEVELOPMENT OF JET FUELS ABROAD, (Razvitiye Topliv Dlya Vozdushno-Reaktivnikh Dvigateley za Rubezhom)
by V. N. Zrelov. 3 Nov 60, 11p. 35 refs. (Trans. no. MCL-594 from Khimiya i Tekhnologiya Topliv i Masel 12:54-59, 1959)

Unclassified report

DESCRIPTORS: *Jet engine fuels, *Aviation fuels, Fuels, Petroleum, Ramjet propulsion, Jet propulsion, Nuclear propulsion, Supersonic planes, Turbojet engines, Hydrocarbons, Kerosene, Uranium, Free radicals, Boron compounds, Hydrides, *Bibliography, Distilling plants.

The most widely used jet fuels abroad at the present time are the two types of hydrocarbon fuels obtained by direct distillation: the kerosene type and the wide-fraction type. The kerosene type includes kerosene or the ligroin-kerosene fraction of petroleum; the wide-fraction type, together with the ligroin-kerosene fraction, includes also the benzine fraction. The use of wide-fraction fuels for jet engines makes it possible to increase considerably the production of fuels, bringing the total output of fuel to 45-59% of crude. Studies on the improvement of modern supersonic jet aircraft fuels have developed mainly along two basic lines: (1) increasing the thermal stability of fuels at elevated temperatures, which can reach 150-300 degrees under supersonic flight conditions, depending on the speed of flight; and (2) improving the energy characteristics of the fuels (heat of combustion, specific weight, and combustion efficiency), which can increase the range and ceiling. (Author)

AD-256 133 Div. 10, 4
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STRUCTURE GROUP COMPOSITION OF AVIATION KEROSENES OBTAINED FROM THE THERMAL CRACKING OF MAZUT, (Strukturno-Gruppovoy Sostav Aviakerosinov. Poluchennykh pri Termicheskom Krekinge Mazutov)
by M. F. Nagiyev and L. I. Tryapina. 4 Nov 60, 5p. tables (Trans. no. MCL-608 from Doklady Adademii Nauk Azerbaydzhanskoy SSR, 15:119-123, Feb 59)

Unclassified report

DESCRIPTORS: *Aviation fuels, *Kerosene, Processing, Hydrocarbons, Naphthalenes, Ethylenes, Benzenes, Organic compounds, Decomposition, Production, Distilling plants, Petroleum, *Jet engine fuels, Molecular structure.

For the purpose of supplementing the data on the chemical composition of aviation kerosenes obtained during thermal cracking of mazut, the structure-group composition was determined by the dispersion-refraction method of Deanesly and Carleton (Ind. Eng. Chem. Anal. Ed., 14:220-226, 1942). The change in the structural composition of aviation kerosenes in relation to their yields occurs with complete regularity, i.e., with increase in the yield of aviation kerosenes the amount of aromatic and paraffin structures increases, while the amount of naphthene and olefin structures decreases. At up to 15% yields of aviation kerosenes, the predominant structures in them are naphthene structures, while at yields higher than 15%, paraffin structures prevail. The structure-group compositions of aviation kerosenes are determined mainly by their yields, regardless of the cracking procedures under which they were obtained. (Author)

AD-256 159 Div. 10, 22
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
(SELECTED ARTICLES FROM) DOKLADY AKADEMII NAUK

SSSR; VOL. 129, NO. 5, 1959 (REPORT OF THE ACADEMY OF SCIENCES USSR).
13 Sep 60, 10p. (Trans. no. MCL-706 from Izdatel'stvo Akademii Nauk SSSR, Moscow 129:1079-1081; 1096-1099, 1959)

Unclassified report

DESCRIPTORS: *Combustion, *Rocket oxidizers, *Solid rocket propellants, Mixtures, Heat, *Flame propagation, *Powders, *Explosives, Theory, Phase studies, Analysis, USSR, Differential equations, Thermodynamics, Mathematical analysis,

Extreme Cases of Solid-Fuel Oxidizer Mixtures, by N. N. Bakhman: A study was made to ascertain the asymptotic aspect of the dependence of combustion speed of mechanical mixtures of a solid fuel and an oxidizer on the size of the particles of the reagents. In the system of very large-sized particles the flame speed, v, strives toward a certain limit as the size of the reagent particles increases. The value of v is determined chiefly by conditions near the snout of the hollow which develops during combustion. The flame propagation also depends on the chemical nature of the oxidizer and its relative density, and on high pressure. The curve of dependence of the combustion speed upon the size of particles for systems with a continuous boundary of separation of fuel with the oxidizer has an S shape. Note on the Steady-State Theory of Heat Balance in the Condensed Phase of Powder and Explosives, by B. I. Plyukhin: A mathematical analysis is presented of heat processes in the condensed phase of steadily-burning powder or explosives. Approximate solutions are given for the equation of heat balance.

AD-256 240 Div. 10
(19 May 61) OTS price $2.60

Aberdeen Proving Ground, Md.
EVALUATION OF COT (COOPERATIVE OIL TEST) MILITARY FUEL TESTING ENGINE,
by D. E. Woomert. May 61, 17p. incl. illus. tables. (Rept. no. DPS-130)

Unclassified report

DESCRIPTORS: *Fuels, *Gasoline, *Antiknock, Effectiveness, Tests, Tests methods, Military requirements.

Tests were conducted to evaluate the COT Military Fuel Testing Engine from a user's viewpoint and to provide data for comparison with data obtained from samples of fuel tested by the standard ASTM methods using the CFR (Cooperative Fuel Research) engine. Approximately 140 tests were conducted using primary reference, army combat, QM reference, and commercial fuels over a wide range of humidity and barometric conditions. The engine rated motor gasoline within one octane number for approximately 95% of the samples tested. The COT Military Fuel Testing Engine is a satisfactory tool for determining octane values of motor gasoline in the field. Investigation should be continued to determine the possibility of using this basic engine to rate aviation and compression-ignition engine fuels. (Author)

AD-256 283 Div. 10
(19 May 61) OTS price $1.60

Massachusetts Inst. of Tech., Cambridge.
ON THE STABILITY OF DETONATION WAVES AT LOW PRESSURES,
by James A. Fay. May 61, 15p. incl. illus. (Proj. Squid TR no. MIT-25-R; Contract Nonr-185825)

Unclassified report

DESCRIPTORS: *Detonation waves, Stability, Low pressure research, Shock waves, Velocity, Chemical reactions, Combustion, Boundary layer, Mathematical analysis.

Relative to combustion theory the proposition is considered that detonation waves are apparently unstable when proceeding at their characteristic Chapman-Jouguet velocities. It is observed that similarities exist between the phenomena of spinning detonation and the more recently discovered unsteadiness, which may be termed structural instability. The theory of boundary layer stability is summarized. Boundary conditions at the shock wave are briefly discussed.

AD-256 400 Div. 10, 3, 9
(22 May 61) OTS price $1.60

Pennsylvania State U., University Park.
CONTACT SURFACE TAILORING IN A CHEMICAL SHOCK TUBE (REVISION)
by Howard B. Palmer and Bruce E. Knox. Apr 61, 6p. incl. illus. tables.
(Proj. Squid TR no. PSU-7-P, rev. of AD-244 939, Contract Nonr-185825)

Unclassified report

DESCRIPTORS: *Shock tubes, Helium, Argon, Mixtures, Rare gases, *Combustion, Shock waves, High temperature research, Hydrogen, Nitrogen, Chemical reactions, Reflection.

A study of gaseous reaction kinetics is presented using a single pulse (chemical) shock tube; the driver-driven gas interface, or contact surface was tailored to prevent multiple shock reflections or rarefactions. The driver gas combination consisted of a mixture of helium and argon. With the driver initially at room temperature, tailored shocks were produced in argon at reflected shock temperatures up to as high as approximately 3300 K. This is high enough for study of most reactions that are amenable to the single-pulse technique. H2-N2 mixtures as driver gas combinations yielded still higher temperatures under tailored interface conditions. Since a set of tailoring conditions for changing driver gas composition were computed and since no previous publication contained results of such computations, these are presented with the thought that they may be useful to others making use of single-pulse shock tubes for chemical studies. (Author)

AD-256 462 Div. 10, 3
(23 May 61) OTS price $2.60

Armour Research Foundation, Chicago, Ill.
INHIBITION OF FLASHING OF AEROSOLS,
by C. C. Miesse. Quarterly progress rept. no. 4, 15 Jan-14 Apr 61. 15 May 61, 24p. incl. illus.
(Contract DA 18-108-405-cml-777)

Unclassified report

DESCRIPTORS: *Aerosols, Aerosol generators, *Flame propagation, Drops, *Fuel sprays, Combustion, Flames, Photographic analysis, Measurement, Ignition, Fluid flow, Liquids, Test equipment, Fuels, Phosphites, Butyl radicals, Phthalates.

Experimental work included design, construction and operation of the aerosol generator and combustion tube; development of a photographic technique for determination of the drop size distribution; and determination of the variation

of flammability limits with operating conditions. This latter phase indicated that the lower limit of flammability increases with the Sauter Mean Diameter (SMD) of the aerosol. Theoretical work included analysis of both stationary and falling aerosols. The former analysis predicted that limit concentrations would be independent of drop size. The latter analysis indicated a negligible variation of concentration with vertical distance; and consideration of the theoretical transverse variation predicted the experimentally observed increase of lower limit concentration with droplet diameter. (Author)

AD-256 607 Div. 10
(26 May 61) OTS price $3.60

Applied Physics Lab., Johns Hopkins U., Silver Spring, Md.
FLAME INHIBITION RESEARCH.
Quarterly progress rept. for 1 Nov 60-31 Jan 61. Feb 61, 1v. incl. illus. tables (Rept. no. TG 376-1)
(Contract NOrd-7386)
(ERDL-21-61) Unclassified report

DESCRIPTORS: *Flame propagation, *Flames, Fuel additives, Atoms, Free radicals, Ions, Diffusion, Electron guns, Inhibition, Mass spectrometers, Tests, Sensitivity, Data processing systems, Current regulators, Instrumentation, Computers, Ignition.

A flat flame burner was set up for flame inhibition studies. The previously studied methane flame (CH4 - 0.078; O2 - 0.92; P = 0.05 atm) was successfully stabilized with added inhibitor (HBr) up to concentrations of 0.0035 mole fraction. Using the uninhibited flame, two flame composition profiles were run on the new time-of-flight mass spectrometer. A third run was made on an inhibited flame to test the sensitivity of the instrument for HBr. From these test runs it was concluded that the instrument requires the addition of a TRAP current regulator to allow quantitative work and forepump trap to shorten the HBr pump-out time. A computing machine routine for the automatic reduction of flame structure data was developed. (Author)

AD-256 609 Div. 10, 27, 30
(26 May 61) OTS price $2.60

Beech Aircraft Corp., Wichita, Kans.
HIGH TEMPERATURE FUEL SYSTEM INVESTIGATION,
by G. E. Roos, V. E. Isakson and others. Quarterly Progress rept. no. 3, 15 May 61. 15 May 61, 18p. incl. illus tables (Engineering rept. no. 9379A)
(Contract AF 33(616)7073, Proj. 30280)
Unclassified report

DESCRIPTORS: *Jet engine fuels, Aviation fuels, *Fuel systems, *Fuel tanks, High temperature research, Temperature, Deposits, Decomposition, Heat transfer, Cooling, Chromatographic analysis, Tests, Stability, Contamination, Test equipment, Test methods.

AD-256 678 Div. 10
(29 May 61) OTS price $18.50

Bell Aerosystems Co., Buffalo, N. Y.
RESEARCH AND DEVELOPMENT ON THE BASIC DESIGN OF STORABLE HIGH-ENERGY PROPELLANT SYSTEMS AND COMPONENTS,
by Ralph R. Liberto. Final rept. 6 July 59-30 Sep 60. 19 May 61, 281p. incl. illus. tables, 92 refs.
(Contract AF 33(616)6689, Proj. 3058)
(AFFTC TR 60-61) Unclassified report

DESCRIPTORS: *Liquid rocket propellants, Storage, *Nitrogen compounds, *Tetroxides, *Hydrazines, *Methyl hydrazines, Decomposition, Stability, Contamination, Impurities, Temperature, Stainless steel, Titanium alloys, Aluminum alloys, Physical properties, Bearings, Lubrication, Seals, Pumps, Handling, Solubility.

Studies were made of nitrogen tetroxide (N2O4), unsymmetrical dimethylhydrazine (UDMH), and hydrazine (N2H4). Pertinent physical property data is presented for each propellant. Data concerning propellant decomposition caused by such contaminants as aluminum and stainless steel chips, lint, constituents of air and hot pressurizing gases is included. High temperature, low temperature, and cycling temperature tests were conducted with each propellant in tanks made of type 347 stainless steel, 6061-T6 aluminum, PH 15-7 Mo stainless steel and C 120 AV titanium. Three explosions were encountered with N2H4 in stainless steel tanks (347 stainless steel and PH 15-7 Mo stainless steel) at temperatures above 290 F. Other than slight decomposition, no problems were encountered with UDMH stored at temperatures up to 300 F. If N2O4 is maintained in the anhydrous state and high vapor pressure can be tolerated, no problems will be expected with N2O4 stored in type 347 stainless steel, PH 15-7 Mo stainless steel, and 6061-T6 aluminum tanks up to 270 F. (Author)

AD-256 688 Div. 10
(29 May 61) OTS price $4.60

Callery Chemical Co., Pa.
PHYSICAL PROPERTIES OF LIQUID PENTABORANE. I. DENSITY. II. VISCOSITY. III. SOLUBILITIES OF NITROGEN, HYDROGEN AND HELIUM IN PENTABORANE,
by C. F. Boynton and J. P. Cherenko. May 61, 1v. incl. illus. tables.
(Contract NOa(s) 58-454-d)
Unclassified report

DESCRIPTORS: *Pentaboranes, *Physical properties, Liquids, Solubility, Viscosity, Density, Nitrogen, Helium, Hydrogen.

The density of liquid pentaborane from 15 to 115 C is described by the following equation: d equals 0.6404 minus 0.000883t, where d is density in gms/ml, and t is temperature in C. The viscosity of liquid pentaborane from 0 to 115 C is described by the following equation: log eta equals (344.75/T) minus 1.45851, where eta is viscosity in centistokes, and T is temperature in K. The solubilities of nitrogen, hydrogen and helium in liquid pentaborane at 500, 1000 and 1500 psig from 30 to 150 C are shown. (Author)

AD-256 758 Div. 10, 4, 14
(31 May 61) OTS price $5.60

Little, Arthur D., Inc., Cambridge, Mass.
INVESTIGATION OF WATER-REACTIVE CHEMICALS FOR

ANTI-ICING ADDITIVES IN AVIATION FUELS,
by Ronald J. McCaully, Walter F. Olds, and Peter A. Reiman. Rept. for Feb-Dec 60. Mar 61, 52p. incl. illus. tables.
(Contract AF 33(616)7006, Proj. 3048)
(WADD TR 61-40) Unclassified report

DESCRIPTORS: *Aviation fuels, Additives, *Fuel additives, *Ice prevention, De-icing materials, Dehydrators, *Water, Chemical reactions, Catalysts, Acids, Hydrochloric acid, Phosphoric acids, Boron compounds, Fluorides, Alkoxy radicals, Propanes, Formates, Acetates, Methyl radicals, Valeric acids, Esters, Fuel filters, *Jet engine fuels.

Four compounds have been found effective in preventing filter icing when fuel temperatures are reduced to -65 F, including 2,2-dimethoxypropane, trimethyl orthoformate, trimethyl orthoacetate, and trimethyl orthovalerate. Additive concentrations as low as 0.1% are sufficient to prevent icing when 500 mg/l of water is present in the fuel. Each of the possible additives requires acid catalysis to initiate reaction with water. Several acid systems have been found effective including hydrogen chloride, phosphoric acid, and boron trifluoride. Acid concentrations in the range of 0.015 to 0.040 milliequivalents per ml of additive are sufficient. Acid concentrations in the fuel are so low that corrosion effects are minimized. If necessary, however, certain corrosion inhibitors approved for use in military aviation fuels may be incorporated in the additive-catalysts system. Compatibility of the additive system with the topcoating material used on integral fuel tanks of certain aircraft appears to be satisfactory. The reactive additive systems are soluble in the fuel and will react with any water or ice present to form soluble and combustible reaction products. Thus water in the fuel system is chemically destroyed and removed from the aircraft. (Author)

AD-256 787 Div. 10, 4, 27
(29 May 61) OTS price $8.10

Olin Mathieson Chemical Corp., New Haven, Conn.
STUDY OF SUPEROXIDIZERS,
by F. Martinez and J. A. Wojtowicz. Technical rept. for 5 June 58-5 Nov 60. Apr 61, 79p. incl. illus. tables, 72 refs. (Rept. no. OMCC-9038-GFR-1)
(Contract AF 29(600)1667, Proj. 3827-9971)
(AFOSR-105) Unclassified report

DESCRIPTORS: *Rocket oxidizers, *Hydrogen compounds, *Oxides, Synthesis, Ozone, *Peroxides, Chemical reactions, Benzenes, Quinones, Propyl radicals, Magnesium compounds, Chlorides, Cumenes, Hydrogen, Heat of formation, Electrolysis, Ultraviolet radiation, Dissociation, Organic compounds, Decomposition, Hydroperoxides, Photolysis.

The results are presented of studies conducted on the preparation of higher oxides of H. The reaction of ozone with hydrazobenzenes, substituted hydroquinones, isopropyl magnesium chloride and cumene did not produce higher oxides. The reaction of O atoms with secondary butyl alcohol produced a normal peroxide. Electrolysis and uv irradiation of dilute hydrogen peroxide solutions did not produce higher peroxides. The reactions of hydrogen atoms with ozone at -196 C gave rise to superoxides, presumable HO2 and H2O4. These species decomposed at -120 and -90 C, respectively, to give molecular O and H2O2. A mechanism is advanced for the production of these products. The heat of formation of HO2 is +13 + or - 10 kcal per mole, and -2 + or - 10 kcal per mole for H2O4. The products obtained from H2O and H2O2 in a discharge tube and by the reaction of H atoms with O are compared to the peroxides formed in the H atom-ozone reaction. (Author)

11. GROUND TRANSPORTATION EQUIPMENT

AD-256 815 Div. 11, 33
(1 June 61) OTS price $7.60

Army Transportation Research Command, Fort Eustis, Va.
ALL-TERRAIN TIRES,
by John E. Thomas and George B. Penn. Final rept. Apr 61. 75p. incl. illus. tables (TREC Technical rept. no. 61-11)
(Proj. no. 9R47-16-010)
Unclassified report

DESCRIPTORS: *Tires, Snow, *Terrain, Vehicles, Soils, Tests, Roads.

Tests were conducted to determine the extent that the mobility of a standard military M52 truck tractor and M127 semitrailer could be increased by the use of commercially available all-terrain tires rather than the standard 11.00 by 20 dual tires normally used on these vehicles. The all-terrain tires (18.00 by 20 by 48 and 24.00 by 20 by 48) are the largest tires that could be mounted on the tractor-semitrailer combination without modification of the vehicles or increase in the overall vehicle width. Tests of the all-terrain tires were conducted in areas of deep snow, mud, desert, established road networks, and typical off-road terrain. Included in the testing was the determination of braking distances, drawbar pull, fuel consumption, and endurance qualities. Tests results established that the all-terrain tires are definitely superior to the standard military tires in snow, mud, and general off-road terrain; however, when compared to the standard military desert tire (14.75 by 20) during desert tests, performance of the all-terrain tire was marginal and in some cases inferior to that of the desert tire. (Author)

Division 12 - GUIDED MISSILES

12. GUIDED MISSILES

AD-256 025 Div. 12, 25
(16 May 61) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
THE EFFECT OF RADIATION FORCE ON SATELLITES OF CONVEX SHAPE.
by Herbert B. Hall. May 61, 53p. incl. illus. tables. (Technical note D-604)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-604.

DESCRIPTORS: *Satellite vehicles, Convex bodies, Satellite attitude, Satellite vehicle trajectories, Solar energy, Pressure, Solar atmosphere, Reflection, Orbital flight paths, Light, Physical properties, Surfaces, Mathematical analysis, Spheres, Conical bodies, Parabolic bodies.

Studies were made for application to computations of both a satellite's attitude and trajectory, which are to take into account the effects of the radiation pressure. The radiation force acting on a body is a function of certain physical properties, of which the reflectivity of the body's surface is the most important. The force F can be expressed in the form: F equals po x A x CF. A means the projected area of the body and po is the radiation pressure in the vicinity of the earth. The function CF was introduced in analogy to the aerodynamic expression for the drag, and may be called the radiation force coefficient. The research objective was to derive accurate formulas and limits for the radiation force coefficient for certain convex bodies. (Author)

AD-256 071 Div. 12, 19, 26
(15 May 61) OTS price $1.60.

Motorola, Inc., Riverside, Calif.
PASSIVE SEEKER FOR SURVEILLANCE DRONE,
by R. C. Fletcher, A. C. Lindberg and others.
Final rept. Supplement no. 1, Sep 58-Dec 60. Apr 61, 8p. (Rept. no. RLF-3841-1, Suppl. no. 1 to AD-323 098)
(Contract DA 36-039-sc-78024)
Unclassified report

DESCRIPTORS: *Surveillance drones, Airborne, *Radar homing, *Radar target seekers, Design, *Aerial reconnaissance, *Costs, Reduction, Materials, Electronic equipment, Tools, Guidance, *Production, Aluminum alloys, Glass textiles, Laminates, Radar jamming, Radar equipment,

Efforts were continued on the design and development of passive homing equipment for guiding Army surveillance drones toward enemy ground based jammers. A summary is presented of the studies made to attain the least unit cost in production. Continuous efforts to minimize production costs were applied at every stage of system development. The initial design of the equipment and the selection of components, materials, techniques, and processes were all directed toward achieving a low production cost consistent with acceptable system performance. All of these factors and typical examples of their effect in reducing future production costs are discussed. (Author)

AD-256 107 Div. 12
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE FIRST STEP INTO THE COSMOS (Pervyy Shag V Kosmos)
by A. G. Karpenko. 8 Nov 60, 8p. illus. (Trans. no. MCL-344 from Izvestiya, p. 4, 9 June 57)
Unclassified report

DESCRIPTORS: Technological intelligence, USSR, *Satellite vehicles, Orbital flight paths, Relativity theory, Rocket motors, Launching.

Soviet comments are reported on the significance of putting a satellite vehicle into orbit. The value of obtaining information about space with satellite instrumentation is noted. It is observed that the correctness of Einstein's Theory of Relativity can be proven by means of satellite vehicle studies. The possibilities of using photobatteries or atomic generators as power sources are pointed out.

AD-256 165 Div. 12
(17 May 61) OTS price $2.60

Directorate of System Engineering, Wright-Patterson Air Force Base, Ohio.
EFFECTS OF XLR-99 ENGINE NOZZLE OPTIMIZATION ON MAXIMUM ENGINE PERFORMANCE,
by Erich L. Eggers. Mar 61, 17p. incl. illus. tables.
(WADD TN 61-42) Unclassified report

DESCRIPTORS: *Hypervelocity vehicles, Design, Re-entry vehicles, *Research planes, Rocket motors, *Rocket motor nozzles, Operation, Conical nozzles, Mathematical analysis, Thrust, Theory, Parasite planes, Rocket planes, Specific impulse.

The mission of the X-15 aircraft engine requires that the engine operate at 40,000 to 250,000 feet altitude. Since nozzle optimization is presently at 17,000 feet, methods of increasing engine performance by optimization of the nozzle to higher altitudes were studied. Theoretical results indicate that optimization can be achieved at 40,000 feet by extending the present nozzle 18 inches. The exit area of this nozzle would still be within the limits imposed by the contour of the X-15 tail section. Optimization over 40,000 feet would probably require major design changes. (Author)

AD-256 236 Div. 12, 2, 25
(18 May 61) OTS price $1.60

Science and Tech. Section, Air Information Div., Washington, D. C.
TRACKING OF MISSILES AND SPACE VEHICLES. REVIEW OF SOVIET LITERATURE.
Monthly rept. no. 10 for Apr 61.
1 May 61, 10p. incl. illus. table. (AID rept. no. 61-61)
Unclassified report

DESCRIPTORS: *Guided missiles, *Satellite vehicles, *Tracking, *Guided missile tracking systems, USSR, *Plasma physics, Propagation, Electromagnetic waves, Technological intelligence, Waveguides, Perturbation theory, Radio waves, Ionosphere, Planetary atmospheres, *Radio astronomy, Microwave oscillators, Ammonia, Ionospheric disturbances.

Contents:
Results of measurement of radio-wave absorption in the ionosphere
Propagation of centimetric waves in waveguides filled with a plasma of a positive-column discharge
Ammonia molecular oscillator operating without the use of liquid nitrogen
Measuring electron density in the ionosphere and interplanetary space
Propagation of ion cyclotron waves in plasma
On the problem of perturbations occurring during the motion of a body in a plasma
Molecular oscillator without a freezing system
Fluctuations of atmospheric radiation

AD-256 266 Div. 12
(19 May 61) OTS price $1.10

Aircraft Armaments, Inc., Cockeysville, Md.
DESIGN, DEVELOPMENT AND FABRICATION OF NIKE ZEUS HANDLING EQUIPMENT,
by K. S. Nevin, H. W. Schuette, Progress rept. 1-31 Mar 61. 31 Mar 61, 5p. (Rept. no. ER-2290B)
(Contract DA 28-017-501-ORD-4173, Proj. TN2-8109)
Unclassified report

DESCRIPTORS: *Guided missiles, Surface to air, Handling, Guided missile warheads, Guided missile noses, *Dollies, Processing, Design, *Ground support equipment.

Handling equipment is to be developed for the nose cone, warhead and adaption kit of the NIKE ZEUS missile. The equipment is to consist of two slings and a dolly; one sling for removing the warhead from its packing box and subsequent handling and a second sling for removing the nose cone from its packing box and for replacing it after the warhead has been installed. The dolly is required for intermediate handling and assembly work. The fabrication of one complete set of prototype equipment was begun. (Author)

AD-256 307 Div. 12, 9, 27
(19 May 61) OTS price $5.60

Institute of Aerophysics, U. of Toronto (Canada).
NON-LINEAR EFFECTS IN THE LONGITUDINAL DYNAMICS OF A LIFTING VEHICLE IN A CIRCULAR ORBIT,
by R. S. Rangi. Oct 60. 18p. illus. tables. (UTIA technical note no. 40)
(Contract AF 49(638)761)
(AFOSR-210) Unclassified report

DESCRIPTORS: *Orbital flight paths, High altitude, *Satellite vehicles, *Aerodynamics, Thrust, Stability (Longitudinal), Satellite attitude, Numerical analysis, Motion, Perturbation theory, Pitch, Mathematical analysis, Rocket propulsion, *Propulsion.

The second order terms were added to the linear equations of motion for a lifting vehicle in a circular orbit with small perturbations. The gravity-gradient effect on pitching moment is also included. The equations were solved on an analogue computer. Transient solutions were obtained. The effect of gravity gradient became more important than the aerodynamic moment at high altitude and governed the pitching mode. The second order effects for the perturbations considered were found to be unimportant. It was concluded that the linear theory is applicable so long as the non-dimensional perturbation quantities are of reasonable order, say 0.2. (Author)

AD-256 320 Div. 12
(22 May 61) OTS price $1.60

Aircraft Armaments, Inc., Cockeysville, Md.
DESIGN, DEVELOPMENT AND FABRICATION OF NIKE ZEUS HANDLING EQUIPMENT,
by K. S. Nevin and H. W. Schuette. Progress rept. for 17 Dec 60-31 Jan 61. 31 Jan 61, 9p. (Rept. no. ER-2290)
(Contract DA 28-017-501-ORD-4173, Proj. TN2-8109)
Unclassified report

DESCRIPTORS: *Guided missiles, Surface to air, Ground support equipment, Design, Guided missile noses, Guided missile warheads, Handling, Dollies, Hoists.

Research concerns the development of handling equipment for the nose cone and the warhead of the NIKE ZEUS missile. The equipment was to consist of two slings and a dolly; one sling for removing the nose cone from its packing box and for replacing it after the warhead had been installed. The dolly was required for intermediate handling and assembly work. A design was agreed upon which appeared to meet the needs for handling the NIKE ZEUS warhead nose cone. (Author)

AD-256 321 Div. 12
(22 May 61) OTS price $1.10

Aircraft Armaments, Inc., Cockeysville, Md.
DESIGN, DEVELOPMENT AND FABRICATION OF NIKE ZEUS HANDLING EQUIPMENT,
by K. S. Nevin and H. W. Schuette. Monthly progress rept. 1-28 Feb 61. 28 Feb 61. 9p. incl. illus. (Rept. no. ER-2290A)
(Contract DA 28-017-501-ORD-4173, Proj. TN2-8109)
Unclassified report

DESCRIPTORS: *Guided missiles, Surface to air, Ground support equipment, Design, Guided missile noses, Guided missile warheads, Handling, Dollies.

AD-256 352 Div. 12, 26
(23 May 61) OTS price $8.60

Bendix Systems Div., Bendix Aviation Corp., Ann Arbor, Mich.
EAGLE MISSILE SYSTEM. PROGRAM REVIEW AND EVALUATION HANDBOOK - PERT.
19 Jan 61, 1v. incl. illus. tables (Rept. no. BSR-414)
(Contract NOa(s) 59-6211-c)
Unclassified report

DESCRIPTORS: *Guided missiles, Air-to-air, Handbooks, Management engineering, Research program administration, Data processing systems, Statistical analysis, Computers, Production, Data transmission systems, Coding, Scheduling.

A handbook is described, the purpose of which is to introduce to Bendix EAGLE contractors and participants, the program evaluation and review technique (PERT SYSTEM) concept and to assist them in applying PERT techniques to their areas of responsibility within the EAGLE Missile System. The material reflects information and concepts acquired from a number of different sources. Among them include the Navy Special Projects Office, Lockheed Missile and Space division, and the Bureau of Naval Weapons. (Author)

Division 12 - GUIDED MISSILES

AD-256 359 Div. 12, 6
(22 May 61) OTS price $2.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
COHERENT SCATTERING OF A METALLIC BODY IN THE PRESENCE OF AN IONIZED SHELL,
by L. Peters, Jr. and W. G. Swarner. 7 Mar 61. 12p. incl. illus. 16 refs. (Scientific rept. no. 2; rept. no. 1116-4)
(Contract AF 19(604)7270)
(AFCRL-310) Unclassified report

DESCRIPTORS: Coherent scattering, Scattering, *Electromagnetic waves, *Satellite vehicles, Plasma physics, Ionosphere, *Radar echo areas, *Spheres, Wake, *Radar reflections, Dielectrics, Metal plates, Mathematical analysis, Model tests, Ionization, Measurement, *Ionospheric propagation.

The problem of scattering of electromagnetic waves by a satellite which acquires an ionized coating while traversing the ionosphere is considered. An ion or electron shell may have considerable effect on the echo area of a satellite. This effect was examined for several models, the first of which is that originally proposed by Jastrow and Pearse. A spherical satellite becomes charged and acquires a concentric sheath of the opposite charge. The scattering cross section is obtained by considering the ionized sheath to have the macroscopic properties of a dielectric material. The resultant boundary condition problem is solved exactly. Alternative approximate solutions which are useful for determining the scattering cross sections of bodies of arbitrary shape were developed. Among the interesting results obtained is that the configuration is nearly invisible for some cases. Another model examined is that developed by Dolph and Weil. Significant echo areas are obtained by two mechanism. The first occurs when the radar frequency falls below the plasma frequency of the shell and the second, when the evacuated trail acts as a dielectric rod antenna. (Author)

AD-256 492 Div. 12, 8, 30
(25 May 61) OTS price $7.60

Inter-Range Instrumentation Group, White Sands Missile Range, N. Mex.
TECHNICAL PRESENTATION AT JOINT SESSION OF DATA REDUCTION AND COMPUTING AND ELECTROMAGNETIC PROPAGATION WORKING GROUPS OF IRIG 16 OCTOBER 1957, SANTA MONICA, CALIFORNIA,
by Fred S. Hanson. Oct 60, 66p. incl. illus. tables, 25 refs. (IRIG Document no. 101-58)
Unclassified report

DESCRIPTORS: *Propagation, *Radar tracking, *Optical tracking, Electromagnetic waves, *Guided missile tracking systems, Errors, Instrumentation, Atmosphere refraction, Refraction, Refractive index, Radiosondes, Meteorological data, Mathematical analysis, Data processing systems.

Contents:
Types of propagation error - definition
Magnitude of propagation errors vs. capabilities and requirements - significance
Basic correction equations - conformance with laws of physics, meteorology, geometry, calculus, algebra; Limitations as to wavelength, elevation angle, altitude, horizontal range
Numerical integration of meteorological data
Empirical substitution and series expansion
Programming and coding
Real-time systems
Reliability of propagation corrections

AD-256 493 Div. 12
(25 May 61) OTS price $12.00

Inter-Range Instrumentation Group, White Sands Missile Range, N. Mex.
PROCEEDINGS OF THE SECOND ALL-IRIG SYMPOSIUM. 12 Oct 58, 156p. incl. illus. tables. (IRIG Document no. 107-58)
Unclassified report

DESCRIPTORS: *Symposia, *Guided missiles, Test facilities, Instrumentation, Tracking, Guided missile tracking systems, *Satellite vehicles, Data processing systems, Guided missile trajectories, Telemeter systems, Command systems, Data transmission systems, Optical tracking, Meteorology, Propagation, Electromagnetic waves, Orbital flight paths, Photography, Extraterrestrial bases.

Contents:
The National Aerohautics and Space Administration's role in instrumentation; Earth satellites and their scientific implications; Long-range telemetry data acquisition; Target acquisition for space tracking; Real time data processing for the space age; Satellite tracking; The case for a staging station; Fundamental accuracy requirements in the prediction of Keplerian trajectories; Problems of range measurements with special application to the establishment of an orbit of an artificial asteroid; Trajectory measurements in the space age; Optical range instrumentation in the space age; Meteorology in the space age; From mouse to moon; Electromagnetic propagation in the space age; Coordinates in space; Effect of deflection of the vertical on the location and orientation of instrumentation; Telemetry in the space age; Standard frequency transmission and time signals; Radio command control in the space age; and Instrumentation in the space age.

AD-256 509 Div. 12, 9
(24 May 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC CHARACTERISTICS IN PITCH OF A SERIES OF CRUCIFORM-WING MISSILES WITH CANARD CONTROLS AT A MACH NUMBER OF 2.01,
by M. Leroy Spearman. May 61, 40p. incl. illus. tables (NASA Technical note D-839; Supersedes NACA Research memo. L53I14, AD-19 950)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-839.

DESCRIPTORS: Supersonic flow, *Supersonics, *Canard configurations, *Cruciform wings, *Control surfaces, *Stability (Longitudinal), Aerodynamics, *Guided missiles, Model tests, Aerodynamic configurations, Supersonic wind tunnels.

The investigation was conducted in the Langley 4- by 4-foot supersonic pressure tunnel. The missiles had cruciform wings and canard surfaces of delta planform with 70 degrees swept leading edges. Five models were tested with fineness ratios varying from 19.1 to 14.8. The tests covered an angle-of-attack range up to about 28 degrees for the complete configuration and various combinations of component parts. (Author)

AD-256 546 Div. 12, 9, 25
(24 May 61) OTS price $1.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
ON THE EROSION OF SATELLITE SURFACES DUE TO SPUTTERING IN THE FREE MOLECULAR FLOW REGION,
by D. N. Vachon. Mar 61. 11p. incl. tables.
(TIS rept. no. R61SD041)
(Contract DA 36-039-sc-85236)
(ARPA Task no. 55-59) Unclassified report

DESCRIPTORS: *Satellite vehicles, *Surfaces, *Space flight, Erosion, *Superaerodynamics, Atmosphere, Upper atmosphere, Particles, Solar atmosphere, Solar flares, *Atoms, Bombardment, Solid state physics.

The erosion of a satellite surface due to sputtering is evaluated and found to be rather small. The depth of erosion is on the order of one to one hundred Angstroms for a time period of one year. The present uncertainties are indicated for the various parameters used in the evaluation. (Author)

AD-256 594 Div. 12
(25 May 61) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
A SEQUENCE DIAGRAM ANALYSIS OF THE VANGUARD SATELLITE LAUNCHING VEHICLE,
by William J. D. Escher and Richard W. Foster. May 61, 40p. incl. illus. tables (Rept. no. TN-D-782)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note no. D-782.

DESCRIPTORS: *Satellite vehicles, *Staging, *Booster rockets, Operation, Launching, Test vehicles, Analysis, Flight testing, *Rocket motors, *Rocket propulsion.

The Vanguard Sequence Diagram method, introduced in AD-203 077, is applied to depict the operating sequence of the Vanguard Satellite Launching Vehicle. It relates vehicle systems operation during final countdown preparations through lift-off, and includes the entire flight program to satellite separation in orbit. On the basis of information from the diagram, a brief system analysis of the vehicle is performed. The results are presented graphically and include: Vehicle state, state-transition breakdown; Vehicle component makeup; Launch program events; Flight profile of cumulative events and vehicle components remaining; Condensed sequence diagram; and Vehicle in-flight sequencing; flight-test results. A narrative description of the vehicle launch program is included by way of a verbal interpretation of the master sequence diagram. (Author)

AD-256 612 Div. 12, 27
(26 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE PATHS TO SPACE FLIGHT,
by H. Oberth. 18 Nov 60, 23p. incl. illus. (Trans. no. MCL-420 from Wege Zur Raumschiffahrt, pp. 409-423, Berlin, 1929)
Unclassified report

DESCRIPTORS: *Spaceships, *Electric propulsion, Theory, *Satellite vehicles, Space flight, Molecules, Electric discharges, Thrust, Electrostatics, Electrons, Ions, Germany, Solar energy.

AD-256 740 Div. 12, 27
(31 May 61) OTS price $1.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
DETONATION TEST AEROJET SENIOR MOTOR TEST 60-13,
by D. E. Hasselmann. Apr 61, 11p. incl. illus. tables. (Rept. no. AFFTC TR 61-20)
Unclassified report

DESCRIPTORS: Guided missiles, Guided missile boosters, *Research test vehicles, *Rocket motors, Hazards, Tests, Booster rockets, *Solid rocket propellants, Explosives, Explosion damage, Detonation, Blast, Explosions.

The Aerojet SENIOR Rocket Motor is presently used for the first stage of the Blue Scout (TS 609A) missile. To determine the possible hazards of the motor, a detonation test was conducted. The detonation of a 100 pounds Composition B charge affixed to the side of the motor did not cause complete detonation of the propellant. The equivalent yield of the propellant was approximately 600 pounds of Pentolite. This is less than 3 percent of the total propellant weight. The furthest distance that shrapnel or burning propellant was thrown was 1200 feet. Approximately 4000 pounds (20 percent of total weight) of propellant was recovered unburned after the test. From these results, it appears unlikely that complete detonation of this propellant in an Aerojet SENIOR Rocket Motor can be made to occur under any normal conditions. (Author)

AD-256 871 Div. 12, 19
(1 June 61) OTS price $8.10

Rand Corp., Santa Monica, Calif.
A GENERALIZED FORMULATION FOR INERTIAL NAVIGATORS AND GRAVITATIONALLY STABILIZED SATELLITES,
by G. Gordon and N. C. Smith. 10 Mar 61, 83p.
(Research memo. no. RM-2323)
(Contract AF 49(638)700, Proj. Rand)
Unclassified report

DESCRIPTORS: *Inertial navigation, Gravity, *Satellite vehicles, Stability, Measurement, Oscillation, Mathematical analysis, Motion, Orbital flight paths, Instrumentation.

This report provides a three-dimensional mathematical analysis of two types of inertial navigators in use today. The resulting analytical expressions give the inertial navigators' position and azimuth errors in terms of the sensing instrument performance. The same equations can be used in analyzing the rotational motion of a gravitationally stabilized satellite. The results of this study may prove to be applicable to mobile missile programs, which at present propose to use systems of the sort analyzed here. (Author)

13. INSTALLATIONS AND CONSTRUCTION

AD-256 269 Div. 13, 14
(19 May 61) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
PLASTIC PRESSURE TUBING AND FITTINGS. AN AN-

NOTATED BIBLIOGRAPHY,
comp. by Helen M. Abbott. Apr 61, 21p. 72 refs.
(Special bibliography no. SB-61-15)
Unclassified report

DESCRIPTORS: *Bibliography, Plastics, *Plastic tubing, *Plastic pipes, Pipes, Pipe fittings, Materials, Laminates, Design, Pressure, Temperature, Physical properties, Mechanical properties.

The bibliography contains references to aid in evaluating what type of plastic material could be used for tubing and fittings. The purpose of the search was to find availability, usage and application of plastic pressure tubing and fittings capable of withstanding 200 psi and temperatures of 200 F. The material was to be of a non-woven type, impervious to water and to have not less than a three-year lifetime. The references are arranged alphabetically by author. The following sources were used: (1) LMSD card file; (2) Engineering Index for 1960-1956; (3) Society Plastics Engineer Journal for 1960-1957; (4) Chemical Abstracts for 1957; (5) Plastics for 1960-1958; (6) Modern Plastics; (7) Modern Plastics Encyclopedia for 1961-1960; and (8) Technical Abstract Bulletins. (Author)

AD-256 315 Div. 13, 11, 25
(22 May 61) OTS price $7.60

Ordnance Tank-Automotive Command, Detroit, Mich.
ANALYSIS OF TOWED PNEUMATIC TIRES MOVING ON SOFT GROUND,
by M. G. Bekker and Z. Janosi. Mar 60, 68p. incl. illus. (Rept. no. RR-61; rept. no. LL-62)
(Proj. 570-05-001 and 5510.11.822)
Unclassified report

DESCRIPTORS: *Tires, Pressure, *Soils, *Motion, Load distribution, Friction, Tests, Test methods, Sand, Mechanical properties, Integral equations, Mathematical prediction, Vehicle wheels, Theory.

A theory by which pneumatic tire sinkage and motion resistance can be calculated has been developed. The formulae based on this theory have been verified by comparing experimental results obtained from tests conducted on several different soils with predicted results using the equations. The agreement between experimental and predicted results was acceptable. (Author)

AD-256 381 Div. 13, 16, 29
(19 May 61) OTS price $1.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
SHELTER HABITABILITY STUDIES - ODORS AND REQUIREMENTS FOR VENTILATION,
by James S. Muraoka. 8 May 61, 18p. 18 refs.
(Technical rept. no. 146)
(Proj. Y-F011-05-401(b))
Unclassified report

DESCRIPTORS: *Shelters, *Ventilation, Acceptability, *Odors, Survival, Stress (Physiology), Stress (Psychology), Perception, Control, Man, Air.

Studies are presented on the effects of body and tobacco smoke odors on men who are confined. Ventilation requirements for the removal of these odors from enclosed structures are indicated. The number of persons (smokers and non-smokers) occupying a shelter and the fresh air supply are two important factors affecting the quality of the air. The outdoor air temperature, the humidity and the number of occupants influence the amount of fresh air supply needed to maintain a comfortable atmosphere in the shelter. Methods found to be effective in reducing the concentration of body odors and tobacco smoke in closed rooms are: fresh outdoor air supplied through a simple ventilation system, recirculation of indoor air through charcoal filters or through a spray-type dehumidifier, use of deodorants, and an increase in the temperature and humidity of a room. (Author)

AD-256 742 Div. 13, 8
(31 May 61) OTS price $8.60

Battelle Memorial Inst., Columbus, Ohio.
THE CONCEPTION AND PRELIMINARY EVALUATION OF ADVANCED COOLING TECHNIQUES FOR GROUND-BASED ELECTRONIC EQUIPMENT,
by D. E. Bearint and A. W. Carey, Jr. Mar 61, 92p. incl. illus.
(Contract AF 30(602)2178, Proj. 5519)
(RADC TR 61-79) Unclassified report

DESCRIPTORS: *Air conditioning equipment, *Electronic equipment, Cooling, Refrigerant compressors, Reliability, Air force equipment, Heat exchangers, Design, Tests, Mobile.

The present state of the air-conditioning art is reviewed as applied to the cooling of Air Force mobile ground-based electronic equipment. Basic cooling processes are summarized and evaluated for possible application to refrigeration cycles. Recommended cooling processes are applied to thermodynamic-cycle analyses and compared on the basis of power requirements and probable equipment size and weight. Thermodynamic analyses cover mechanical, electrical, and heat-motivated refrigeration cycles and devices. Advisability of employing waste heat from a reciprocating internal-combustion engine to power a cooling system is investigated and found insufficient. It is concluded that present air-conditioning systems, based on the vapor-compression refrigeration cycle, are the most practical and efficient means for the cooling of ground-based electronic equipment. Regenerative Stirling-cycle equipment has the inherent thermodynamic ability to exceed efficiency of vapor-compression cycles, but is presently inferior due to technological limitations. Continued refinement of vapor-compression equipment in areas of compressors, heat exchangers, and air-moving equipment is recommended. (Author)

AD-256 804 Div. 13
(2 June 61) OTS price $3.60

Army Engineer Research and Development Labs., Fort Belvoir, Va.
TANK-CLEANING SET, RESPIRATORY,
by B. F. Whaley. 7 Mar 61, 25p. incl. illus.
(Technical rept. no. 1669-TR)
Unclassified report

DESCRIPTORS: Maintenance equipment, Tests, Cleaning, Design, Respirators, Materials, Beryllium alloys, Hazards, *Maintenance, Maintenance tools, Oil tanks, *Storage tanks, Propellant tanks.

This report covers the development and engineer testing of a tank-cleaning set for use in the maintenance and cleaning of all types of metal, bulk-petroleum, storage tanks. The use of non-

sparking hand tools does not enhance tank-cleaning fire safety and since the availability of beryllium-copper tools will be critical during national emergencies, amendment of the Corps of Engineers Manual EM 385-1-1, General Safety Requirements, is needed to permit the substitution of steel hand tools. Service testing of the Tank-Cleaning Set, Respiratory is not required in view of the off-the-shelf nature of the components, the universal acceptance of the items by the petroleum industry in tank-cleaning operations, and the successful performance of the set in the engineer test. Based on the results of the engineer test, the Tank-Cleaning Set, Respiratory satisfies the requirements of Task 8M53-03-001-04 and is suitable for classification as military standard. (Author)

AD-256 810 Div. 13, 16
(29 May 61) OTS price $3.60

Ammunition Group, Picatinny Arsenal, Dover, N. J.
AIR AND STREAM POLLUTION CONTROL. PRELIMINARY SURVEY OF THERMAL METHODS FOR TNT RED WATER DISPOSAL,
by D. Kite, Jr. Mar 61. 1v. incl. illus. 10 refs. (Technical rept. no. DB-TR:10-60)
(Proj. 252-9503-0104-311)
Unclassified report

DESCRIPTORS: *Chemical waste, Disposal, TNT, Purification, Air, *Water, Water supplies.

The study revealed: A combination freezing-incineration process is unsuitable at this time since the needed freezing technology has not been established. The Zimmerman process is unsatisfactory because the effluent therefrom remains toxic. A combined submerged combustion-incineration process is feasible if a cheap source of natural gas is available. The evaporation-incineration process is effective but expensive, capital investment being estimated at $445,000 for a capacity of 50 tons TNT per day and operating costs being estimated at 45 cents per 100 pounds of TNT. The Atomized Suspension Technique appears promising, but pilot studies are needed to establish its efficiency. (Author)

14. MATERIALS (NON-METALLIC)

AD-256 041 Div. 14, 4, 8, 26
(16 May 61) OTS price $10.10

Lansdale Tube Co., Pa.
INDUSTRIAL PREPAREDNESS MEASURE FOR HIGH PURITY SILICON,
by Jack M. Hirshon. Final rept. 26 June 57-31 Oct 60. 31 Oct 60, 78p. incl. illus. tables. (Rept. no. R215.1F)
(Contract DA 36-039-sc-72768)
Unclassified report

DESCRIPTORS: *Silicon, Purification, Production, Single crystals, Electrical properties, Silanes, *Manufacturing methods, Resistance, Life expectancy, Processing, Growth, Materials, Semiconductors, Specifications.

A process was developed to produce ultra high purity single crystal silicon having a resistivity greater than 500 ohm-centimeter and a minimum lifetime of 400 microseconds from silane. A summary of the electrical characteristics of the delivered material is presented. The plant in which this silicon was produced has a capacity of ten pounds per month; engineering data was obtained to enable expansion to a larger scale production. (Author)

AD-256 110 Div. 14
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE SCIENCE OF GLASS AT THE EIGHT MENDELEYEV CONGRESS (Nauka O Stekle Na VIII Mendeleyevskom S'Ezde)
14 Nov 60, 11p. (Trans. no. MCL-434 from Steklo I Keramika, pp. 1-4, 1959)
Unclassified report

DESCRIPTORS: Optical glass, USSR, *Glass, *Conferences, Materials, Silicates, Manufacturing methods, Crystal structure, Microstructure, Spectrographic data, Oxides, Photochemistry, Cerium compounds, Melting, Phosphate glass, Boron compounds, Barium compounds, X-ray diffraction analysis, Electrical properties, Heat treatment, Chemical properties, Physical properties, Surface properties.

The Eight Mendeleyev Congress, dedicated to the 125-th birthday of the great scientist, took place in Moscow during the second half of March of the current year. Problems in the development of chemical science were discussed at the plenary sessions and at the sessions of the eighteen sections of the congress. Considerable attention was alloted to the problems of the chemistry and technology of silicates, which was the topic of discussion at one of the sections. Approximately 30 reports were given which were devoted to the study of the structure of glass, the creation of new types of glass for various branches of engineering, and other important problems of glass technology. (Author)

AD-256 111 Div. 14
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SPECIAL GLASS FOR NON-SHATTER WINDSHIELD (Steklofon)
by A. G. Minakov, Z. F. Korchagina, and N. I. Pogarskiy. 15 Nov 60, 4p. incl. illus. (Trans. no. MCL-436 from Steklo i Keramika, pp. 21-22, Aug 59)
Unclassified report

DESCRIPTORS: Optical glass, *Glass, USSR, Manufacturing methods, Heat treatment, Hardness, Brittle materials, Thermal stresses, Mechanical properties, *Windshields, Clays, Fracture (Mechanics), Ceramic coatings, Coatings, Phosphate glass, Aluminum, Paints, Preparation, Production.

A method was developed for producing a glass called steklofon, the inner and outer sections of which have different degrees of hardness. Thus, when one section is shattered the other remains whole, keeping its transparency. The technique of producing steklofon involves the separation of its inner and outer sections during heating in an electric furnace and during air cooling, where they are subjected to different thermal treatments. For this purpose the inner section of the glass must be protected by a special shield or by some other method. A simple means of shielding the center section of the glass is to put a protective covering of kaolin and aluminum paint on its surface. (Author)

Division 14 - MATERIALS (NON-METALLIC)

AD-256 146 Div. 14, 26
(18 May 61) OTS Price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CEMENTING OF METAL (Lepeni Kovu).
15 Nov 60, 4p. incl. illus. (Trans no. 665 from Kridla Vlasti 3, p. 10, 2 Feb 60)
Unclassified report

DESCRIPTORS: *Metals, *Adhesives, *Metal seals, Bonding, Bonded joints, Alloys, USSR, Resin adhesives.

AD-256 208 Div. 14
(18 May 61) OTS price $6.60

Owens-Corning Fiberglas Corp., Granville, Ohio.
HIGH TEMPERATURE PROPERTIES OF VITREOUS FIBERS AND COATINGS,
by W. M. Edmunds. Final rept. 8 Feb 60-8 Feb 61. 1 Apr 61, 65p. incl. illus. tables.
(Contract NOa(s) 60-6068-c)
Unclassified report

DESCRIPTORS: Glass, Fibers, *Glass textiles, Filaments, Coatings, *Synthetic fibers, Plastic coatings, Acrylic resins, Epoxy resins, Phenolic resins, Resins, *Heat resistant glass, Silicones, Silanes, Heat resistant polymers, High temperature research, Mechanical properties, Metal coatings, Temperature, Tensile properties.

Tensile strength-temperature relations for E-glass monofilaments coated with A1100 coupling agent, CIBA 6005 epoxy resin, DC 2106 silicone resin, and SC 1013 phenolic resin show that each coating by itself improves fiber strength retention up to temperatures of 500 - 600 F. Tensile tests at elevated temperatures on production E-glass fibers showed that the mechanical damage incurred in textile production processing masks the effects of various coatings. A high temperature candidate experimental glass composition, X-815, was studied both uncoated and coated, and was found to have strengths above 200,000 psi at temperatures up to 1500 F. Houze glass fibers had average virgin strengths of 500,000 psi at room temperature. Service temperature limit of this glass is 1400 F compared to 1240 F for E-glass and 1750 F for X-815 glass. (Author)

AD-256 218 Div. 14, 26, 31
(18 May 61) OTS price $1.60

Materials Testing Lab., Portsmouth Naval Shipyard, N. H.
DEVELOPMENT OF SYNTHETIC RUBBER MATERIAL FOR GASKETS AND PACKINGS IN DEEP SUBMERGENCE SUBMARINES,
by Billy H. Swift and Frederick L. Downs. Progress rept. no. 1, 28 Mar 61, 9p. incl. tables.
(Proj. no. SF 013 13 01)
Unclassified report

DESCRIPTORS: *Gaskets, *Rubber gaskets, *Synthetic rubber, Rubber, Nitrile rubber, Elastomers, Submarines, Pressure, Tests.

A total of 9 rubber stocks were tested to determine their various physical properties pertinent to the function of gasket material for deep submergence submarines. Of these 9 stocks, 5 were formulations already available, and the other 4 stocks were formulations developed in the laboratory. An analysis of test data compiled at this time indicates that one of the stocks already available and 2 of the newly developed stocks should be put through a pressure cell, or simulated service test for evaluation as deep submergence gasket material. (Author)

AD-256 233 Div. 14
(18 May 61) OTS price $8.10

New York State Coll. of Ceramics, Alfred U.
GRAIN SIZE EFFECTS ON THE THERMAL CONDUCTIVITY OF CERAMIC OXIDES,
by J. R. Tinklepaugh, R. S. Truesdale and others. Rept. for 1 Nov 59-31 Oct 60, on Surface and Interface Phenomena of Matter. Feb 61, 77p. incl. illus. tables, 64 refs.
(Contract AF 33(616)3798, Proj. 7022)
(ARL-5) Unclassified report

DESCRIPTORS: *Ceramic materials, Aluminum compounds, Magnesium compounds, Oxides, *Heat transfer, Grains (Metallurgy), Heat treatment, Microstructure, Chemical impurities, Mechanical properties, Crystals, Processing, Elasticity, Rupture.

Dense, fine grained alumina samples were employed in a study of the effect of grain size on thermal conductivity in polycrystalline alumina. Thermal conductivity in the range 100 to 1000 C decreased slightly but significantly as the average grain size was varied from 10 to 4 to 2; this effect followed closely an additive reciprocal volume relationship. The role of impurities in masking this effect in dense alumina samples of purity exceeding 99% was shown. Strength and modulus of elasticity measurements were made of A1203 and MgO. Dense samples of MgO were produced by using hot pressing techniques.

AD-256 259 Div. 14, 26
(19 May 61) OTS price $4.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
INVESTIGATION OF HIGH TEMPERATURE RESISTANT MATERIALS,
by N. E. Poulos, S. R. Elkins, and J. D. Walton. Quarterly rept. no. 20, 1 Feb-30 Apr 61. 30 Apr 61. 42p. incl. illus. tables.
(Contract NOrd-15701, Proj. A-212)
Unclassified report

DESCRIPTORS: *Refractory materials, Cermets, *Ceramic materials, Silicon compounds, Silicates, Oxides, Ethyl radicals, Aluminum compounds, Chlorides, Impregnation, Processing, Vacuum apparatus, Flame spraying, Heating, Manufacturing methods, Castings, Radomes, *Ceramic coatings.

X-ray diffraction analysis showed the absence of cristobalite in ethyl-silicate-40-impregnated samples. The effect of multiple impregnation on the strength of fused silica test bars impregnated with 10, 30, 50% solutions of A1C13.6H20 was studied. Samples impregnated with the 10% solution cracked in cooling after the second refiring cycle; the strength of slip-cast fused silica was reduced from 3750 to 730 psi after the first impregnating and refiring cycle. A decrease in strength and an increase in cristobalite content were also exhibited by samples impregnated with 30 and 50% A1C13.6H20. A revised vacuum-pressure technique of impregnating slip-cast fused silica was studied. The study of flame glazing was continued. An IR quartz tube furnace was constructed to control annealing temperatures of glazed samples; the fused silica samples were successfully glazed by annealing but cracked upon cooling.

AD-256 345 Div. 14, 25
(22 May 61) OTS price $1.10

Duke U., Durham, N. C.
DESIGN AND ANALYSIS OF STRUCTURAL ELEMENTS,
by Robert S. Rowe and Jehangir F. Mirza.
Progress rept. no. 8, 4 Feb-4 May 61. 4 May 61, 8p. incl. illus.
(Contract DA 36-034-ORD-2864, Proj. TB4-003)
Unclassified report

DESCRIPTORS: *Structural shells, *Structures, Design, Analysis, Deformation, Tests, Test methods, Plastics, Stresses, Glass textiles, Resins, Reinforcing materials, Plasticity.

Continued research is reported on the design and analysis of structural elements. The structures were manufactured using alternate 90 degrees lay-ups of 181A Volan glass cloth and Polyester Resin 4116. The 1/8 inch thick shells were composed of four hyperbolic paraboloidal panels, each of which is a combination of four typical quadrants. Two series of tests are described and discussed. The first series of tests indicate that the effect of lateral restraint is indeed significant. Total restraint may be a practical impossibility, but partial restraint may be realized by increasing edged members and lateral braces. The hyperbolic paraboloidal shell is approximately twice as rigid in the inverted position than in the normal position. The tests to failure indicate that this type of structure, in most cases, will buckle before it will fracture. This condition also calls for increased sections along the edges and ridges. (Author)

AD-256 414 Div. 14, 22
(22 May 61) OTS price $1.60

Rocketdyne, Canoga Park, Calif.
PREIMPREGNATED ROVING STUDY.
Monthly progress rept. 13-30 Apr 61. 15 May 61, 9p. incl. table (Rept. no. R-3024-1)
(Contract NOw 61-0498-c)
Unclassified report

DESCRIPTORS: Resins, *Epoxy resins, Rocket cases, *Impregnation, Propellant tanks, Test equipment, Temperature, Pressure, *Textiles, Synthetic fibers, Laminates, Plastic thread, Filament-wound construction, Tests.

A description is given of the development work initiated on the effects of resin advancement, winding tension, resin content, tackiness, and volatile content in connection with application of preimpregnated roving. A further description is given of the devices being developed for testing tackiness in preimpregnated roving. (Author)

AD-256 504 Div. 14, 12, 26
(23 May 61) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
POLYESTER FILM BELTS,
by John H. Licht and Arthur White. May 61, 18p. incl. illus. (NASA Technical note no. D-668)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-668.

DESCRIPTORS: *Belts, Computers, Satellite vehicles, *Plastics, Films, Polymers, Mechanical properties, Failure (Mechanics), Dielectric properties, Tests, Manufacturing methods, *Power transmission belts, Recording systems, Digital recording systems, *Pulleys, Servo systems, *Esters, Recording devices.

Successful application of oriented-polyester film belts has been demonstrated in the Atlas-Score, Vanguard II, and Tiros I satellite tape recorders. Better performance of recorders in future NASA meteorological satellites may be expected if polyester film is used. Fatigue resistance, high stress tolerance, uniformity, and ability to be driven by extremely small pulleys are some of the many properties which make these belts superior for use in a number of mechanical instrumentation and power transmission applications. The objective of this paper is to indicate performance based on a limited number of tests; to suggest design criteria; and to describe fabrication procedure, applications, and superior characteristics. The belts have essentially flat and homogeneous cross sections and are fabricated from sheet Mylar in thicknesses of 1/2 to 10 mils. (Author)

AD-256 599 Div. 14, 25
(25 May 61) OTS price $9.10

New Jersey Ceramic Research Station, Rutgers U., New Brunswick.
THEORY OF GLASS STRUCTURE,
by Harold T. Smyth, Robert H. Meinken, and Haven S. Skogen. Final rept. 1961. 99p. incl. illus.
(Contracts N7onr-34503 and Nonr-40415)
Unclassified report

DESCRIPTORS: *Glass, *Crystal structure, Theory, Specific heat, Molecular structure, Thermal expansion, Elasticity, Viscosity, Optics, Photoelasticity, Latices, Atoms, Stresses, Mathematical analysis, Refractive index, Physical properties, Fluid flow, *Ceramic materials.

An outline is presented of theoretical treatments of the connection between various physical properties of glasses and a simple model of the network structure of these glasses. The following properties are included: (1) thermal capacity; (2) thermal expansion, (3) elastic properties; (4) viscous flow; and (5) stress optical properties.

AD-256 677 Div. 14
(29 May 61) OTS price $1.60

Borden Co., Philadelphia, Pa.
STUDY LEADING TO THE DEVELOPMENT OF HIGH TEMPERATURE RESISTANT ADHESIVES,
by J. Dickstein and B. D. Halpern. Quarterly progress rept. no. 3, 22 Dec 60-31 Mar 61. 31 Mar 61, 18p. incl. illus.
(Contract DA 36-034-ORD-3316, Proj. TB 4-002)
Unclassified report

DESCRIPTORS: *Adhesives, *Heat resistant polymers, Polymers, *Resin adhesives, Triazines, Alcohols, Phenols, Phenolic resins, *Metal plastic adhesives, Stability, Temperature, Thermosetting resins, Synthesis, Chemical reactions, Methyl radicals.

Poly 2,6-xylenol gave shear strength values of 2500 psi on stainless steel when tested at room temperature. Tests at 500 F gave weak strength

values. Thermogravimetric analysis (TGA) showed negligible weight losses up to 752 F. Carboxy, bromomethyl, quaternary bromide, and silane derivatives were prepared from the parent polyxylenol. TGA results showed some of these derivatives to be inferior to the parent polyxylenol in regard to heat stability. In addition, the adhesion of these compounds at room temperature was quite poor. Work was continued on the modification of melon and the condensation polymer of benzoguanamine and diphenyl carbonate into metal adhesives. The general principle applied was the attachment of amino groups followed by salt formation with acids believed capable of etching the surface. The highly refractory nature of melon was successfully overcome by reduction with hydrazine sulfate at high temperatures to a product called hydromelon. This high melting product could be dissolved readily in dilute mineral acids in order to utilize the heat stability of the triazine rings in conjunction with modification of hydromelon into a metal adhesive. A high melting product was obtained by the reaction of benzoguanamine with either terephthalic acid or isophthalic acid. The same products were also prepared from the corresponding diphenyl esters of these acids. (Author)

AD-256 689 Div. 14, 20
(29 May 61) OTS price $14.00

Convair, Fort Worth, Tex.
THE EFFECTS OF REACTOR RADIATION ON ELASTOMERS AND SEALANTS. III,
by L. L. Morgan. 28 Apr 61, 202p. incl. illus. tables, 16 refs. (ANP Document no. NARF-60-37T; NR-N-174-3)
(Contract AF 33(600)38946)

Unclassified report

DESCRIPTORS: *Elastomers, Polymers, Sulfides, *Rubber seals, *Sealing compounds, *Rubber adhesives, Adhesives, *Radiation damage, Synthetic rubber, Storage, Tensile properties, Mechanical properties, Gamma rays, Neutron bombardment.

Fifteen types of liquid polymer polysulfide sealants and one crude polysulfide sealant have been irradiated. Included were Products Research PR-1201 and PR-1422; Minnesota Mining EC-1610, EC-1605, EC-1520, EC-1373, and EC-801; Churchhill 3C-1050; Thiokol ST; and seven laboratory formulations from the Thiokol Chemical Corporation. Tensile specimens of each of the sealants were irradiated in air and fuel. Some peel specimens were irradiated. Irradiations were conducted to a maximum dose of 2.5 x 10 to the 10th power ergs/gm(C) gamma and 1.5 x 10 to the 16th power n/sq cm (where E is greater than 0.33 Mev). The adhesion of sealants is not appreciably affected by radiation. The irradiations in fuel produced more damage than irradiations in air. (Author)

AD-256 744 Div. 14, 12
(31 May 61) OTS price $1.60

Bjorksten Research Labs., Inc., Madison, Wis.
HIGH VISCOSITY REFRACTORY FIBERS,
by Stanley A. Dunn and William P. Roth. Quarterly rept. no. 5, 20 Oct 60-31 Jan 61. 31 Jan 61, 16p. incl. illus. tables.
(Contract NOrd-19100)

Unclassified report

DESCRIPTORS: *Ceramic fibers, Ceramic materials, *Refractory materials, Viscosity, *Glass textiles, Powder metals, Copper, Silver, Silicon compounds, Dioxides, Thermal insulation, Insulating materials, Guided missiles, Additives, X-ray diffraction analysis, Density, Temperature, *Glass, Diffusion.

A dispersion of finely divided metallic Cu in vitreous SiO2 markedly increased the viscosity of the latter. X-ray diffraction indicated that most of the Cu was present as metal; no evidence of oxides of Cu was found. Measurements by a loop test method taken in conjunction with density indicate that the Young's Modulus and ultimate tensile strength of SiO2 fiber may not be greatly altered by the presence of dispersed Cu. Ag, like Cu, dispersed readily in molten SiO2 to produce a higher viscosity material. Many other metals dispersed in SiO2 though not so readily as Cu and Ag, viscosity increases were noted in each case. The degree and uniformity of the mixing of Cu and SiO2 was considerably improved by construction of a mechanical device. A limited amount of SiO2 fiber containing dispersed Cu was drawn in the cane unit, admixture of the components being carried out simultaneously. Further preparations were made for investigating the effect of additive particle size on the viscosity of molten materials. (Author)

AD-256 759. Div. 14, 8
(31 May 61) OTS price $10.50

Monsanto Chemical Co., Everett, Mass.
HIGH TEMPERATURE DIELECTRIC LIQUID MATERIALS FOR POTTING OF ELECTRONIC COMPONENTS,
by Glenn R. Wilson, George L. Ball, III, and Elizabeth A. McElhill. Final rept. 3 Dec 59-2 Dec 60, Dec 60. 123p. incl. illus. tables.
(Contract NObs-78294)

Unclassified report

DESCRIPTORS: *Dielectrics, Electronic equipment, *Embedding substances, Liquids, High temperature research, Capacitors, Benzenes, Diphenyl, Ethers, Polymers, Phenyl radicals, Silicates, Silanes, Benzyl radicals, Cyclohexanes, Methanes, Chlorides, Phenoxy radicals, Silicones, Oils.

Several organic liquids and low-melting solids were found that are quite thermally stable for long periods of time (500-2000 hr) at 350 C. The compounds synthesized and evaluated included: benzylated o-terphenyl; polyphenyl ethers; aromatic silicates and polysilicates; diphenyldibenzylsilane; o-tercyclohexyl; phenoxy derivatives of diphenylmethane; chlorinated biphenyls (Aroclors); silicone oils; and ferrocenyl polysiloxanes. The benzylated o-terphenyl met all the requirements for capacitor use. A second candidate material is the polyphenyl ether (OS-124). Tetrakis(o-biphenyl)silicate also has excellent thermal stability and acceptable dielectric properties but is a solid (mp approx. 85 C); however, it has a great tendency to exist at 25 C in a supercooled state. Another material that is a solid (mp 60 C) with good dielectric properties is diphenyldibenzylsilane. The methyl silicone oils have excellent dielectric properties but undergo extensive degradation upon prolonged heating at 350 C, yielding volatile products. The remainder of the materials did not have satisfactory dielectric properties or did not survive the aging period of 350 C. (Author)

AD-256 789 Div. 14, 4, 25
(29 May 61) OTS price $6.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
DILUTE SOLUTION PROPERTIES OF AN UNFRACTIONATED POLY (N-DOCOSYL METHACRYLATE),
by Eleanor C. Schramm, Richard J. Valles, and David M. Levi. May 61. 69p. incl. illus. tables, 20 refs. (Technical rept. no. FRL TR 36)
(DA proj. 599-01-004)

Unclassified report

DESCRIPTORS: *Polymer solutions, *Acrylic resins, Molecular weight, Molecular structure, Alkyl radicals, Polymers, Organic solvents, Light, Scattering, Measurement, Viscosity, Determination, Refractive index, Viscosimeters, Refractometers, Photometers.

Initial light scattering measurements on unfractionated poly(n-docosyl methacrylate) indicated a molecular weight somewhat higher than 8 million. Some kind of association in solution was suspected. Studies in three solvents, two of them at a series of temperatures, showed no evidence of any such association. Determinations were made of molecular weights, chain dimensions, and second virial coefficients at a series of temperatures in two solvents. Results of these measurements are discussed. (Author)

AD-256 875 Div. 14, 1, 29
(31 May 61) OTS price $8.10

Aerospace Medical Div., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
THERMAL INSULATION OF AIR FORCE CLOTHING. A CATALOG AND PART 5 OF A SERIES,
by John F. Hall, Jr. and Johannes M. Polte. Rept. on Physiology of Flight. Sep 60, 75p. incl. illus. tables, 6 refs. (Proj. no. 7164)
(WADD TR 60-597) Unclassified report

DESCRIPTORS: Clothing, *Protective clothing, Air force supplies, *Insulating materials, Thermal insulation, *Air force equipment, Flight clothing, Sleeping bags, Measurement, Plastics, Fibers, *Textiles, Underwear, Catalogs.

Results of the fifth of a series of thermal insulation studies performed with electrically heated hand, foot, head, and entire body models are presented. The experimental data include results obtained with light, medium, and heavy clothing types, as well as with thermal protective items of a specialized nature. A revised catalog listing individually the insulation in clo units of numerous recently developed clothing items is included. These are arranged in order of increasing value in each clothing category (i.e., light, medium, and heavy). Relationship between the measured and calculated thermal insulation of clothing assemblies is shown graphically and correction factors for use with each category of catalogued clothing are graphed. The effect of laundering on thermal insulation of many recent Air Force clothing assemblies is illustrated and discussed. (Author)

Division 15 - MATHEMATICS
15. MATHEMATICS

AD-256 013 Div. 15
(17 May 61) OTS price $2.60

Harvard U., Cambridge, Mass.
CURVATURE PROPERTIES OF TEICHMULLER'S SPACE,
by Lars V. Ahlfors. Mar 61, 25p.
(Contract AF 49(638)574)
(AFOSR-8) Unclassified report

DESCRIPTORS: *Mathematics, *Complex variables, *Algebraic topology.

A point in Teichmuller's space Tg is represented by a closed Riemann surface of fixed genus g(is greater than 1) together with an outer automorphism of its fundamental group. Intrinsic definitions lead to a metric on Tg, introduced by Teichmuller, to a Riemannian structure whose use was suggested by A. Weil, and finally to a complex analytic structure of dimension 3g-3. It was proved by Weil, and with very little computation, it is proved again that the Riemannian metric is Kahlerian with respect to the complex structure. It was reasonable to conjecture that the metric has negative curvature. The main purpose of the work is to verify that the Ricci curvatures are indeed negative. The proof is by explicit computations. (Author)

AD-256 014 Div. 15
(17 May 61) OTS price $1.60

Harvard U., Cambridge, Mass.
ASYMPTOTIC PROPERTIES OF POLYNOMIALS WITH AUXILIARY CONDITIONS OF INTERPOLATION,
by J. L. Walsh. Apr 61. 15p.
(Contracts AF 49(638)574 and AF 49(638)845)
(AFOSR-9) Unclassified report

DESCRIPTORS: Mathematics, *Series, *Polynomials.

Let a closed bounded point set E be given in the z-plane. Necessary and sufficient conditions are found for validity of the following: given assigned conditions of interpolation in a finite number of points: $p_n(z_k) = A_{nk}$; there exists a sequence of polynomials $p_n(z)$ satisfying these conditions and $\lim\sup_{n \to \infty} \max |p_n(z)|$, z on $E^{1/n} = \tau(E)$, where $\tau(E)$ is the transfinite diameter of E. (Author)

AD-256 015 Div. 15
(17 May 61) OTS price $2.60

Harvard U., Cambridge, Mass.
DEGREE OF POLYNOMIAL APPROXIMATION TO AN ANALYTIC FUNCTION AS MEASURED BY A SURFACE INTEGRAL,
by J. L. Walsh. Apr 61, 19p.
(Contracts AF 49(638)574 and AF 49(638)845)
(AFOSR-63) Unclassified report

DESCRIPTORS: *Trigonometry, *Integrals, *Mathematics, Polynomials, Functions.

Results are derived relating continuity properties of f(z) on the boundary C of a region D to $\iint_D |f(z) - p_n(z)|^p dS$, $p > 1$, as a measure of approximation. (Author)

AD-256 016 Div. 15
(17 May 61) OTS price $3.60

Harvard U., Cambridge, Mass.
GRUNSKY INEQUALITIES AND COEFFICIENTS OF BOUNDED SCHLICHT FUNCTIONS,
by Vikramaditya Singh. 1 Apr 61, 31p. 13 refs.
(Contract AF 49(638)574)
(AFOSR-550) Unclassified report

DESCRIPTORS: *Functions, Series, Differential equations, Transformations (Mathematics), Functional analysis.

Let D be a plane finitely connected domain whose boundaries are closed Jordan curves C sub nu and let f(z) be a regular analytic function in D whose coefficients in power series expansion about a point zeta epsilon D are b sub nu. Grunsky had given a set of necessary and sufficient conditions, depending upon b sub nu, so that f(z) may be extended as a schlicht function in D. In the present report, Grunsky's conditions have been extended to the case when f(z) has the additional restriction of being bounded, i.e., /f(z)/ less than 1, z epsilon D. These conditions have then been used to get distortion theorems and coefficient inequalities for bounded schlicht functions in /z/ less than 1 and in /z/ greater than 1. (Author)

AD-256 017 Div. 15
(17 May 61) OTS price $1.60

Harvard U., Cambridge, Mass.
APPROXIMATION BY BOUNDED ANALYTIC FUNCTIONS TO FUNCTIONS REPRESENTED BY DIRICHLET SERIES,
by J. P. Evans and J. L. Walsh. Apr 61. 9p.
(Contracts AF 49(638)574 and AF 49(638)845)
(AFOSR-552) Unclassified report

DESCRIPTORS: *Functional analysis, Series, Functions.

AD-256 038 Div. 15
(17 May 61) OTS price $1.60

Harvard U., Cambridge, Mass.
A NEW GENERALIZATION OF JENSEN'S THEOREM ON THE ZEROS OF THE DERIVATIVE OF A POLYNOMIAL,
by J. L. Walsh. Apr 61. 14p.
(Contracts AF 49(638)574 and AF 49(638)845)
(AFOSR-62) Unclassified report

DESCRIPTORS: *Polynomials, Functions, Transformations (Mathematics).

Let p(z) be a real polynomial all of whose zeros lie in the closed interior of the circle whose diameter is the segment alpha beta of the axis of reals, and let all the non-real zeros lie interior to that circle. For each pair z sub k, conjugate z sub k of conjugate imaginary zeros of p(z) let gamma z sub k be the circle tangent at z sub k and conjugate z sub k to the respective circles alpha z sub k beta and alpha conjugate z sub k beta. Then all non-real zeros of p prime (z) lie in the closed interiors of the gamma sub k. (Author)

AD-256 045 Div. 15
(24 May 61) OTS price $1.10

Virginia U., Charlottesville.
NON-OBSTRUCTING SETS AND RELATED MAPPINGS,
by Gordon T. Whyburn. Technical note no. 19 on Topology and Mathematical Analysis. Aug 60, 8p.
(Contract AF 49(638)72, Proj. 47500)
(AFOSR TN 60-902) Unclassified report

DESCRIPTORS: *Mathematics, *Topology.

A further study is made of the type of sets which separates no region in a locally connected space (Open Mappings on Locally Compact Spaces, Memoirs Amer. Math. Soc. 1:19; On the Invariance of Openness, Memoirs Amer. Math. Soc. 44:464-466, 1958). Their connection with open and related mappings on sets having near-manifold structure is considered.

AD-256 046 Div. 15
(24 May 61) OTS price $1.10

Virginia U., Charlottesville.
CONVERGENCE IN NORM,
by G. T. Whyburn. Technical note no. 20 on Topology and Mathematical Analysis. Oct 60. 5p.
(Contract AF 49(638)72, Proj. 47500)
(AFOSR TN 60-1194) Unclassified report

DESCRIPTORS: *Topology, *Real variables.

By the norm N(f) of a mapping f(X) = Y is meant the least upper bound of $\delta[f^{-1}(y)]$ for $y \in Y$. Here X and Y are metric spaces and $\delta(K)$ is the diameter of K for any set K. Sequences of mappings (f_n) are treated which not only converge in usual way to a mapping f, but also converge in norm in the sense that $N(f_n) \to 0$ as $n \to \infty$. A sequence of sets Y_n is said to converge O-regularly to a set Y [written $Y_n \to Y$ O-regularly] provided that $Y_n \to Y$ in the sense $\lim\sup Y_n = \lim\inf Y_n = Y$ and also for any $\epsilon > 0$ a $\delta > 0$ and an integer N exist such that if $n > N$, any two points $x, y \in Y_n$ with $\rho(x,y) < \delta$ lie together in a connected subset of Y_n of diameter $< \epsilon$. All spaces are assumed to be metric; and for any open set U in a space, Fr(U) denotes the boundary $\bar{U} - U$ of U. (Author)

AD-256 053 Div. 15
(17 May 61) OTS price $7.60

Statistical Techniques Research Group, Princeton, U., N. J.
DISCUSSION, EMPHASIZING THE CONNECTION BETWEEN ANALYSIS OF VARIANCE AND SPECTRUM ANALYSIS,
by John W. Tukey. Mar 61, 68p. 24 refs. (Technical rept. no. 41)
(Contract DA 36-034-ORD-2297, Proj. PB2-0001(1715))
(OOR rept. no. 1715:38) Unclassified report

DESCRIPTORS: *Statistical analysis, Spectrographic analysis, *Analysis of variance, Statistical processes, Series.

The case of a function of time is considered which is periodic with known period. A classical analysis of variance, based on a pattern involving d observations in each of the r.c cells formed by crossing r rows with c columns is studied. Periodic time functions with a fixed period and a stationary joint distribution are also considered. (Author)

AD-256 054 Div. 15
(17 May 61) OTS price $3.60.

Institute for Advanced Study, Princeton, N. J.
ON THE RANGE OF DIFFERENTIAL AND CONVOLUTION OPERATORS,
by Lars Hormander. Apr 61, 39p.
(Contract DA 36-034-ORD-2884, Proj. TB2-0001 (2422))
(OOR rept. no. 2422:9) Unclassified report

DESCRIPTORS: *Operators (Mathematics), *Mathematics, Differential equations,

AD-256 215 Div. 15
(18 May 61) OTS price $1.60

North Carolina U., Chapel Hill.
ON THE CHARACTERISTIC ROOTS OF POWER-POSITIVE MATRICES,
by Alfred Brauer. Oct 60, 13p. (Technical rept. no. 13)
(Contract AF 18(603)38)
(AFOSR TN 60-1032) Unclassified report

DESCRIPTORS: *Mathematics, *Matrix algebra.

A matrix with real elements is called power-positive if a power of it is positive. It is shown that the most important properties of the characteristic roots of positive matrices also hold for power-positive matrices. In particular, the absolute greatest root of a power-positive matrix can be computed as exactly as needed without finding the characteristic equation. (Author)

AD-256 217 Div. 15
(17 May 61) OTS price $9.60

Case Inst. of Tech., Cleveland, Ohio.
SEQUENTIAL DECISION MODELS,
by Yechezkel H. Rutenberg. Apr 61, 116p. incl. tables, 16 refs.
(Contract Nonr-114108)
Unclassified report

DESCRIPTORS: *Operations research, *Statistical analysis, Applied mathematics, *Mathematics, Games theory, Probability, *Sequential analysis.

Contents:
The sequential decision process
Sequential decision processes in discrete time
Sequential decision processes in continuous time
Applications to replacement problems
Applications to queuing problems.
Applications to a coin-tossing game
Appendix: Ties in coin-tossing

AD-256 227 Div. 15
(17 May 61) OTS price $2.60

Manitoba U. (Canada).
STUDIES IN GRAPH THEORY. CONNECTIVITY AND REDUCIBILITY OF GRAPHS,
by A. L. Dulmage, Diane M. Johnson, and N. S. Mendelsohn. 1961, 22p.
(Contract AF 49(638)860)
(AFOSR-601) Unclassified report

DESCRIPTORS: *Algebraic topology, *Matrix algebra.

Corresponding to every graph, bipartite graph or directed bipartite graph there exists a directed graph which is connected if and only if the original graph is connected. It is shown that for every directed graph there exists a certain bipartite graph such that the directed graph is connected if and only if the bipartite graph is irreducible. Other connections between reducibility and connectivity are established. (Author)

AD-256 245 Div. 15
(19 May 61) OTS price $1.10

Colorado U., Boulder.
ON PERIODIC INFINITE RADICALS,
by Georgellen Schuske and W. J. Thron. 1961, 8p.
(Contract AF 49(638)100)
(AFOSR-546) Unclassified report

DESCRIPTORS: *Complex numbers, *Complex variables, *Real variables.

AD-256 284 Div. 15, 25
(19 May 61) OTS price $6.60

North Carolina State Coll., Raleigh.
GENERAL PERTURBATIONAL SOLUTIONS OF THE VAN DER POL EQUATION,
by John E. Fletcher and Raimond A. Struble.
May 61. 59p. incl. illus. (Technical memo. no. 6)
(Contract DA 36-034-ORD-2733, Proj. TB2-0001)
Unclassified report

DESCRIPTORS: *Oscillation, Non-linear systems, *Differential equations, Series, *Perturbation theory, Applied mathematics, Non-linear differential equations.

AD-256 285 Div. 15
(19 May 61) OTS price $3.60

North Carolina State Coll., Raleigh.
GENERAL PERTURBATIONAL SOLUTIONS OF THE DUFFING EQUATION,
by Steve N. Yionoulis and Raimond A. Struble.
May 61, 36p. incl. illus. (Technical memo. no. 7)
(Contract DA 36-034-ORD-2733, Proj. TB2-0001)
Unclassified report

DESCRIPTORS: *Differential equations, *Nonlinear systems, Mathematics, Series, Perturbation theory.

The Duffing equation $\frac{d^2x}{dt^2} + n^2x - \beta x^3 = \beta F_0 \cos \lambda t$ is investigated under various conditions. Asymptotic series solutions are discussed in detail. (Author)

AD-256 353 Div. 15
(23 May 61) OTS price $6.60

RIAS, Inc., Baltimore, Md.
ON LINEAR DIFFERENTIAL EQUATIONS WITH A SMALL PARAMETER,
by Carlos Imaz. Mar 61, 60p. (Technical rept. no. 61-2)
(Contract AF 49(638)382)
(AFOSR-496) Unclassified report

DESCRIPTORS: *Mathematics, Matrix algebra, *Differential equations.

Linear differential systems are studied of the form $w' = Aw + \varepsilon F(t)w$ ($' = d/dt$) where $w = \mathrm{col}(w_1, \ldots, w_n)$, ε is a small parameter, A is an n x n constant matrix and F(t) is an n x n matrix of periodic functions of t, period T, Lebesque integrable in 0, T. (Author)

AD-256 363 Div. 15
(22 May 61) OTS price $5.60

Coordinated Science Lab., U. of Illinois, Urbana.
ON NUMERICAL INTEGRATION OF ORDINARY DIFFERENTIAL EQUATIONS,
by Arnold Nordsieck. May 61, 52p. incl. illus. tables (Rept. no. R-127)
(Contract DA 36-039-sc-85122)
Unclassified report

DESCRIPTORS: *Digital computers, Computers, Data processing systems, *Differential equations, Test methods, Mathematical analysis, Automation, Integration.

A reliable efficient general purpose method for automatic digital computer integration of systems of ordinary differential equations is described. The method operates with the current values of the higher derivatives of a polynomial approximating the solution. It is thoroughly stable under all circumstances, incorporates automatic starting and automatic choice and revision of elementary interval size, approximately minimizes the amount of computation for a specified accuracy of solution, and applies to any system of differential equations with derivatives continuous or piecewise continuous with finite jumps. Illiac library sub-routine no. F7, University of Illinois Digital Computer Laboratory, is a digital computer program applying this method. (Author)

AD-256 370 Div. 15
(22 May 61) OTS price $1.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
TANGENTIAL LIMITS OF FUNCTIONS FROM THE CLASS S SUB ALPHA,
by John R. Kinney. 9 May 61, 4p. (Rept. no. 55 G-0037)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Fourier analysis, Functions, Trigonometry.

Theorem: If $f(z) \in S_\alpha$ and $\gamma < \alpha$, then, except for a set E_γ with $\mathrm{cap}_{1-\gamma} E_\gamma = 0$, there exists a $\gamma\text{-}\lim_{z \to e^{i\psi}} f(z)$ for any $\tau < 1-\gamma/1-\alpha$. (Author)

AD-256 497 Div. 15
(22 May 61) OTS price $3.60

Minnesota U., Minneapolis.
ON THE REGULARITY OF MARKOV PROCESSES,
by Frank Knight. 1 Mar 61, 32p. (Technical rept. no. 13)
(Contract AF 18(603)30)
(AFOSR-529) Unclassified report

DESCRIPTORS: *Statistical analysis, Probability, *Mathematics, *Statistical processes, Topology, Statistical functions, Statistical distributions.

Starting with a continuous parameter Markov process having an arbitrary state space, a related process is defined which possesses certain regularity properties, chief among them being the strong Markov property. The connection of this process with the original process is considered. They are shown to differ with probability zero at each t except for those in a countable set. (Author)

AD-256 547 Div. 15
(24 May 61) OTS price $1.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
GENERALIZED REED-MULLER CODES,
by Edwin Weiss. 11 May 61, 13p. (Rept. no. 55G-0035)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: Coding, Errors, *Mathematics, *Statistical analysis, Vector analysis, Matrix algebra.

AD-256 624 Div. 15, 26, 32
(26 May 61) OTS price $13.50

Numerical Analysis Research, U. of Calif., Los Angeles.
AN APPROACH TO COSTING JOINT PRODUCTION BASED ON MATHEMATICAL PROGRAMMING WITH AN EXAMPLE FROM PETROLEUM REFINING,
by L. Wheaton Smith. Feb 61, 184p. incl. illus. 65 refs. (Management Sciences Research Project; Research rept. no. 70)
(Contract Nonr-23302, Proj. NR 047-003)
Unclassified report

DESCRIPTORS: *Programming, *Costs, Production, *Mathematical analysis, Petroleum industry, Control, *Linear programming, Control systems.

Contents:
Methods of costing joint production
Mathematical models
Economic imputation as a basis for cost allocation
An integrated approach to petroleum refinery, planning, costing, and control

AD-256 662 Div. 15
(26 May 61) OTS price $2.60

Research Triangle Inst., Durham, N. C.
PARTIALLY DUPLICATED FRACTIONAL FACTORIAL DESIGNS,
by M. S. Patel. 12 May 61. 27p. (Technical rept. no. 5)
(Contract DA 01-009-ORD-816)
(AROD 2579:4) Unclassified report

DESCRIPTORS: *Combinatorial analysis.

Two-level fractional factorial designs are given in which some of the treatment combinations are duplicated. As is well known, the duplicated runs provide an unbiased estimate of error variance and more precise estimates of the effects. A numerical example is given with the analysis procedure. Block designs for the corresponding factorial designs are also given. (Author)

AD-256 663 Div. 15
(26 May 61) OTS price $2.60

Research Triangle Inst., Durham, N. C.
ON THE PERFORMANCE OF THE GROUP SCREENING METHOD,
by M. S. Patel. 12 May 61. 21p. (Technical rept. no. 4)
(Contract DA 01-009-ORD-816)
(AROD 2579:5) Unclassified report

DESCRIPTORS: *Sampling, *Statistical tests, Design.

This paper is an extension of Watson's paper (AD-252 698). The fundamental idea pursued is to maximize the expected number of correct decisions by a proper choice of the critical regions in a two-stage design and compare the value with that obtained by maximizing the same in a single-stage design. The basis for this comparison has been laid in Sections 4, 5 and 6. In Section 7, the behavior of some allied functions has been discussed at length. In Section 8, sufficient conditions have been worked out under which a two-stage design will do better than a corresponding single-stage design and vice-versa. Approximate bounds for the expected number of correct decisions in a two-stage design are given in Section 9. (Author)

AD-256 667 Div. 15
(26 May 61) OTS price $1.60

Syracuse U., N. Y.
MEASURE PRESERVING FUNCTIONS ON LOCALLY COMPACT SPACES,
by P. T. Church and M. E. Mahowald. Technical rept. no. 3 on Topological Vector Spaces. Apr 61. 12p.
(Contract DA 30-069-ORD-3069, Proj. 1B 2-0001)
(AROD rept. no. 2653:3) Unclassified report

DESCRIPTORS: *Topology, Functions, *Measure theory, Integral equations, Special functions.

The following theorem is proved: Let M and N be compact metric spaces with Borel measures μ and ν, respectively, such that every non-empty open set has positive measure. Let $f : M \to N$ be a continuous function having the property: whenever both A and f(A) are Borel measurable, then $\mu(A) = \nu(f(A))$. Then there exists a subset F of M of the first category and of measure zero on which f is not one-to-one and such that $f : M - F$ is a homeomorphism. This result without the continuity assumption is then generalized to locally compact metric spaces. The conclusion is slightly weaker. Some examples are given to prove that other likely extensions are false in general. (Author)

AD-256 669 Div. 15
(26 May 61) OTS price $1.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
SEQUENTIAL SAMPLING INSPECTION BY ATTRIBUTES,
by Gideon Schwarz. 12 Apr 61. 10p. incl. illus. tables. (Technical rept. no. 51)
(Contract Nonr-22553, Proj. NR-042-002)
Unclassified report

DESCRIPTORS: Mathematics, Statistical analysis, *Sampling, *Sequential analysis.

The method of asymptotic shapes (Doctoral Dissertation, Columbia Univ. 1960) is applied to the problem of testing whether the mean of a dichotomous variable exceeds a number, or falls short of another number. While the usual procedure, Wald's sequential probability ratio test, is optimal if the true state of nature is known to be one of two numbers, it is far from optimal when the range of the parameter is not restricted. The procedure presented here is a large-sample approximation to the optimal solution for the problem with no a priori restriction on the parameter. It improves on Wald's test especially if it is at all likely that the true state of nature lies in the indifference zone. Furthermore, the procedure has an a priori bound on the number of observations, which may sometimes be a practical advantage. (Author)

AD-256 670 Div. 15
(26 May 61) OTS price $2.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ASYMPTOTIC MULTIVARIATE OCCUPATION-TIME DISTRIBUTIONS FOR SEMI-MARKOV PROCESSES,
by Rupert G. Miller, Jr. 15 May 61, 25p. (Technical rept. no. 70)
(Contract Nonr-22552, Proj. NR-342-022)
Unclassified report

DESCRIPTORS: Mathematics, *Statistical processes, *Statistical distributions, *Statistical analysis.

Asymptotic bivariate normality is established for the cumulative occupation times of two states in a semi-Markov process with countable state space and also for the cumulative sums of functions defined on the occupation times. The asymptotic moments are given explicitly for a general semi-Markov process with three possible states and a semi-Markov process with countable state space in which F sub ij equals F sub i, i.e., F sub ij independent of j. These results are applied to the zero and one states in a simple M/M/1 queue. (Author)

AD-256 671 Div. 15, 8
(26 May 61) OTS price $3.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
SPECTRAL ANALYSIS OF ASYMPTOTICALLY STATIONARY TIME SERIES,
by Emanuel Parzen. 2 May 61, 32p. (Technical rept. no. 38)
(Contract Nonr-22521, Proj. NR-042-993)
Unclassified report

DESCRIPTORS: Spectrographic analysis, *Correlation techniques, *Statistical analysis, *Communications theory, *Mathematics, *Series.

The conditions under which it can be said that a time series possesses a spectrum are examined. It is shown how to construct a theory of the existence, interpretation, and estimation of the spectrum which is more in accord with the manner in which physical scientists use these ideas than the widely accepted definition of the spectrum based on the notion of a stationary process. Conditions for a time series to possess a generalized harmonic analysis are determined. (Author)

AD-256 679 Div. 15
(29 May 61) OTS price $1.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
REGRESSION ANALYSIS OF VECTOR-VALUED RANDOM PROCESSES,
by W. Freiberger, M. Rosenblatt, and J. Van Ness. Apr 61, 16p. incl. illus. tables (Technical rept. no. 11)
(Contract DA 36-039-sc-78130)
Unclassified report

DESCRIPTORS: *Statistical analysis, Least square method, Probability, Statistical processes, Matrix algebra.

AD-256 761 Div. 15
(31 May 61) OTS price $4.60

Minnesota U., Minneapolis.
ARITHMETIC PROPERTIES OF BERNOULLI CONVOLUTIONS,
by Adriano M. Garsia. 1 May 61, 38p. (Technical note no. 3)
(Contract AF 49(638)857)
(AFOSR-548)
Unclassified report

DESCRIPTORS: *Functional analysis, *Probability, Statistical functions, Sequences, Series, Integral transforms, Algebra, Measure theory, Polynomials.

Distribution functions of the type $F(x,r) = \overset{\infty}{\underset{n=1}{\bigstar}} A\left(\frac{x}{r_n}\right)$ are discussed, where $\sum r_n^2 < \infty$ and the star indicates this convolution operation. The main results obtained are two sets of criteria to decide when F(x, r) is singular and when it is absolutely continuous. These criteria are not necessary but they are fruitful in some cases. The results are illustrated by examples. (Author)

AD-256 780 Div. 15
(31 May 61) OTS price $3.60

Mathematics Research Center, U. of Wisconsin, Madison.
THE BOUNDARY LAYER FORMALISM FOR CONVERGENT SERIES SOLUTIONS OF THE WAVE EQUATION, WITH REFERENCE TO THE FOCUSING OF DISCONTINUITIES, PART II.
by R. N. Buchal. Apr 61, 33p. incl. tables. (MRC Technical summary rept. no. 211)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Mathematics, *Series, Theory, Boundary layer, Wave transmission, *Partial differential equations, Special functions, Wave analysis, Focusing, Propagation.

AD-256 781 Div. 15
(31 May 61) OTS price $3.60

Mathematics Research Center, U. of Wisconsin, Madison.
ON SOME INEQUALITIES IN THE THEORY OF MATRICES,
by A. M. Ostrowski. Mar 61, 37p. (MRC Technical summary rept. no. 217)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Matrix algebra, *Mathematics, Theory, *Inequalities.

AD-256 782 Div. 15
(31 May 61) OTS price $1.10

Mathematics Research Center, U. of Wisconsin, Madison.
PROJECTIONS ON INVARIANT SUBSPACES,
by Walter Rudin. Apr 61, 6p. (MRC Technical summary rept. no. 222)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: *Functional analysis, Integrals, *Mathematics, Integral transforms, Special functions, Operators (Mathematics), Functions. Potential theory.

AD-256 783 Div. 15, 25
(31 May 61) OTS price $1.10

Mathematics Research Center, U. of Wisconsin, Madison.
ON LANCASTER'S DECOMPOSITION OF A DIFFERENTIAL MATRICIAL OPERATOR,
by A. M. Ostrowski. Apr 61, 7p. (MRC Technical summary rept. no. 223)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: Vibration, *Dynamics, Theory, Mathematics, Applied mathematics, Integral equation, Mathematical analysis, Damping, *Differential equations, *Operators (Mathematics), Matrix calculus.

AD-256 784 Div. 15
(31 May 61) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
PERMUTATIONS OF TAYLOR COEFFICIENTS OF BOUNDED FUNCTIONS,
by Walter Rudin. Apr 61, 12p. (MRC Technical summary rept. no. 224)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: Combinatorial analysis, Functions, *Mathematics, *Taylor's series.

AD-256 865 Div. 15
(1 June 61) OTS price $2.60

Syracuse U., N. Y.
SOME TOPICS ON MARKOV CHAINS,
by J. Neveu. April 61, 24p. incl. illus. (Research rept. no. 32)
(Contract AF 49(638)265)
(AFOSR 471) Unclassified report

DESCRIPTORS: *Probability, Statistical analysis, *Mathematics, Matrix algebra.

AD-256 886 Div. 15
(2 June 61) OTS price $1.60

Zator Co., Cambridge, Mass.
A CODING METHOD FOR INDUCTIVE INFERENCE,
by R. J. Solomonoff. Apr 61, 11p. (Rept. no. ZTB-140)
(Contract AF 49(638)376)
(AFOSR-510) Unclassified report

DESCRIPTORS: Probability, *Sequences, *Coding.

A new general inductive inference method has been described in which the a-priori probability of a sequence of symbols is computed on the basis of the lengths of various code strings that could be used to describe that sequence to a universal Turing machine. A coding method is displayed for a simple Bernoulli sequence and the inference technique is applied to the computation of probabilities of symbols in that sequence. The results obtained in this case are shown to be identical to Laplace's rule of succession. The probabilities correspond to Shannon's entropy if the Bernoulli sequence is a very long one. (Author)

16. MEDICAL SCIENCES

AD-256 030 Div. 16
(16 May 61) OTS price $3.60

Illinois U. Coll. of Medicine, Chicago.
THERMAL INJURY OF THE SKIN,
by Sol Roy Rosenthal and Thomas G. Nard. Annual progress rept. 1 May 60-1 May 61. 1 May 61, 31p. incl. illus. tables.
(Contract Nonr-145902)
Unclassified report

DESCRIPTORS: *Skin, *Radiation injuries, *Burns, Thermal radiation, Antitoxins, *Antibodies, Toxicity, Blood.

Studies were conducted to demonstrate that following tissue injury (thermal, traumatic, radiation, chemical) there develops degradation products of tissue breakdown which can be toxic and lethal to the host and that these toxins act as foreign bodies in the host and stimulate the production of autoantibodies. A toxin has been isolated directly from diffusates of burned skin of rats in vivo circumventing the circulation. This toxin is fatal to mice and rats in acute or chronic experiments; Injection of this toxin plus Freund's adjuvant into rabbits produces precipitins to the toxin and hemoagglutinins and hemolysins to red cells of acutely burned rats. In preliminary experiments in mice, this rat-toxin rabbit anti-sera, when incubated with or injected after rat toxin detoxifies appreciably the action of the toxin. Thus far it has been shown that the serum of burned human subjects is cytotoxic to HeLa cells, cytolytic to injured red cells, and that the sera of healed burned humans have an enhanced capacity to neutralize the cytotoxic effect on HeLa cells in vitro, and clinical evidence suggests a similar in vivo effect. (Author)

AD-256 040 Div. 16
(17 May 61) OTS price $2.60

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
BEES AND POLARIZED LIGHT,
by Edward R. Bayler and Frederick E. Smith. Final rept. Apr 61, 24p. incl. illus. tables (Rept. no. 03388-1-F)
(Contract Nonr-122405)
Unclassified report

DESCRIPTORS: *Insects, Behavior, Brightness, Polarization, Light, Tests, Eye.

AD-256 145 Div. 16
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
JOURNAL OF MICROBIOLOGY (SELECTED ARTICLES)
7 Nov 60, 4p. (Trans. no. MCL-654 from Mikrobiologichniy Zhurnal 1:46; 51; 55; and 60, 1959)
Unclassified report

DESCRIPTORS: *Salmonella, Sea water, USSR, Survival, *Shigella, Typhus fever, *Staphylococcus, *Antibiotics, Resistance, Streptomycins, *Intestinal bacteria, Pharmacology.

AD-256 158 Div. 16
(18 May 61) OTS price $4.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STUDY OF THE DEPTH OF THE ANTERIOR CHAMBER (PHYSIOLOGICAL VARIATIONS WITH PARTICULAR EMPHASIS ON AMETROPIA)(Etude de la Profondeur de la Chambre Anterieure (Variations Physiologiques et au Cours des Ametropies))
by Calmettes, Deodati, and others. 21 Sep 60, 44p. (Trans. no. MCL-695 from Archives of Ophthalmology 18:513-542, 1958)
Unclassified report

DESCRIPTORS: *Eye, Physiology, Pathology.

AD-256 169 Div. 16
(18 May 61) OTS price $1.60

California U., Los Angeles. School of Medicine.
INTERIM PROGRESS REPT. 1 OCTOBER 60-31 MARCH 1961.
by Gordon A. Alles and M. David Fairchild. Apr 61, 10p.
(Contract DA 18-108-405-cml-735)
Unclassified report

DESCRIPTORS: *Behavior, Animals, Drugs, Mescaline, Cerebral cortex, Electrodes, Barbiturates, *Pharmacology, Test methods, Electrical properties, Frequency analyzers, Electroencephalography, *Hallucinogens.

This report includes:
METHYLENEDIOXY-AMPHETAMINE HALLUCINOGENIC SERIES OF COMPOUNDS. PART I. Apr 61, 10p.
(Contract DA 18-108-405-cml-735)

CONDITIONED BEHAVIOR AND ELECTROENCEPHALOGRAPHIC TEST METHODS. PART II. Apr 61, 10p.
(Contract DA 18-108-405-cml-735)

AD-256 235 Div. 16, 1
(18 May 61) OTS price $1.60

Science and Tech. Section, Air Information Div., Washington, D. C.
SOVIET LITERATURE ON LIFE SUPPORT SYSTEMS.
Monthly rept. no. 2 for Mar 61. 28 Apr 61, 10p. incl. illus. tables (AID rept. 61-59)
Unclassified report

DESCRIPTORS: *Bibliography, *Space medicine, Physiology, Perception, *Radiation injuries, Antibiotics, Therapy, Space flight, USSR, *Space environmental conditions.

AD-256 242 Div. 16, 20
(19 May 61) OTS price $2.60

Arkansas U. Medical Center, Little Rock.
BIOLOGICAL RECOVERY FROM RADIATION DAMAGE IN SMALL ANIMALS,
by John W. Lane and Walter Mauderli. Technical note. Mar 61, 29p. incl. illus. tables, 19 refs.
(Contract AF 29(601)1160)
(AFSWC TN 61-3) Unclassified Report

DESCRIPTORS: *Animals, Gamma rays, Recovery, *Radiation injuries, Mathematical analysis, Analog computers, Cobalt, Labelled substances.

Male, black C57 mice were exposed to multiple, small acute doses of gamma radiation from a Co60 source. Following a recovery period of one month, the dose required to result in a mean survival time of 30 days was determined. The differences

in doses required for mice subjected to 600 and 1,200 r priming doses and that required in non-irradiated controls was seen to be 20% and 15.8% respectively. This residual radiation damage is felt to be high when compared to other reported data, and possible reasons for this are considered. A mathematical model is presented which describes radiation damage and its subsequent repair. An analog computer was utilized to study the possible curves resulting when the parameters and constants of the model were varied. These curves were compared to available experimental data and the contents for the best fit of the experimental points to the computer curves were determined. The results are promising, but more experimental data and further study of the analog computer curves are necessary. (Author)

AD-256 260 Div. 16, 1
(17 May 61) OTS price $1.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
A3J-1 SPIN SIMULATION PROGRAM ON THE NAVY HUMAN CENTRIFUGE,
by Robert Z. Snyder. 17 Mar 61. 14p. incl. illus. tables. (Rept. no. NADC-MA-6104)
(Task MR005.15-0005.6; rept. no. 9)
Unclassified report

DESCRIPTORS: Acceleration, Accelerometers, Jet planes, Pilots, *Acceleration tolerance, Centrifuges, Simulation, *Spin, Tests, Naval personnel, Stress (Physiology).

The Navy acceptance tests for the A3J-1 include a spin test of five turns before starting recovery. Pilot ability to recover the aircraft while subjected to spin type acceleration loads was evaluated through the operation of the human centrifuge, so as to simulate an A3J-1 spin of eleven turns, with either steady or oscillatory loading during either normal or inverted spins. It was found that the pilots were capable of performing the required recovery procedures while exposed to the various predicted loads. (Author)

AD-256 261 Div. 16
(17 May 61) OTS price $1.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
ACCURACY OF LEVER-DISPLACEMENT BEHAVIOR OF RATS FOLLOWING EXPOSURE TO POSITIVE ACCELERATIONS,
by Robert M. Herrick. 19 Apr 61, 11p. incl. illus. (Rept. no. NADC-MA-6111)
(Task MR 005.15-0002.16; rept. no. 5)
Unclassified report

DESCRIPTORS: *Acceleration, Physiology, *Animals, Motion, Muscles, Centrifuges, Stress (Physiology), Neuromuscular transmission.

Rats were trained to press a T-bar handle of a response lever through an arc of at least 23.62 degrees but no greater than 28.76 degrees (Lever Position 5). This behavior was evaluated immediately following five minutes exposure to each of the following positive G values: 2, 5, 10, 15, 20. The behavior was not influenced at the lower G values. At the higher G values, the lever-pressing rate decreased, but the percentage of lever-presses made to Position 5 remained the same. (Author)

AD-256 294 Div. 16
(19 May 61) OTS price $1.60

Naval Medical Field Research Lab., Camp Lejeune, N. C.
THE INFLUENCE OF TISSUE PREPARATION AND PERIOD OF DRUG ACTION ON THE RESPONSE OF ISOLATED GUINEA PIG ILEAL SEGMENTS TO HISTAMINE DIPHOSPHATE,
by Ellzsworth B. Cook. Apr 61, vol. 11, no. 9, pp. 1-19, incl. tables, 14 refs.
(Proj. no. MR 005. 06-0020.1.4)
Unclassified report

DESCRIPTORS: *Tissues (Biology), *Intestine, *Histamines, Phosphates, Pharmacology, Histological sections, Preparation, *Muscle relaxants.

Isolated ileal segments from ale guinea pigs were exposed to five logarithmically spaced concentrations of histamine diphosphate. Tissue responses were measured at 1- and 3-minute intervals following the introduction of each concentration. No statistically significant differences were found between tissue responses at the 1- and 3-minute intervals. Responses were slightly more consistent 3 minutes after introduction of histamine. However, since the peak contraction occurred 1 minute following exposure to histamine, responses were better defined and simpler to measure at that interval. Statistically significant differences were found between preparations whose open lumen permitted free access of the drug to both internal and external surfaces and preparations whose closed lumen permitted drug action only on the external surface. (Author)

AD-256 334 Div. 16, 2
(22 May 61) OTS price $1.60

Scripps Institution of Oceanography, U. of Calif., La Jolla.
RESEARCH ON THE DEPOSITION OF SILICA BY DIATOMS,
by Joyce C. Lewin. Final rept. 10 Apr 61, 15p. incl. tables. (SIO ref. no. 61-11)
(Contract Nonr-322100)
Unclassified report

DESCRIPTORS: *Algae, Deposits, Culture, Identification, Nutrition, Glucose, Lactates, Marine biology, *Silicon compounds, *Dioxides, Growth, Genetics.

Contents:
Continuation of studies on the heterotropic nutrition of diatoms
Continuation of studies with Phaeodactylum tricornutum
Study of the interconversion of the two cell types, oval and fusiform
Tests of the effect of external factors on the conversion of one cell type to the other
Large-scale cultures of marine diatoms

AD-256 350 Div. 16, 29
(23 May 61) OTS price $16.50

Quartermaster Food and Container Inst. for the Armed Forces, Chicago, Ill.
PERFORMANCE CAPACITY. A SYMPOSIUM CONDUCTED BY THE NUTRITION BRANCH, FOOD DIVISION, QUARTERMASTER FOOD AND CONTAINER INSTITUTE FOR THE ARMED FORCES AND ENVIRONMENTAL PROTECTION RESEARCH DIVISION, QUARTERMASTER RESEARCH AND ENGINEERING CENTER, CHICAGO, APRIL 12 AND 13, 1957, ed by Harry Spector, Josef Brozek, and Martin S. Peterson. Feb 61, 257p. incl. illus. tables, 242 refs.
(Sponsored by Advisory Board on Quartermaster Research and Development Committee on Foods)
Unclassified report

DESCRIPTORS: *Symposia, *Physiology, *Nutrition, Stress (Physiology), Tests, *Physical fitness, Heat tolerance, Psychomotor tests, Digestive system, Circulatory system, Food.

Contents:
Body functions involved in work and their use to predict performance capacity
Application of standard work tests
Effects of environmental stresses on performance capacity

AD-256 356 Div. 16, 28
(23 May 61) OTS price $1.60

Yale U., New Haven, Conn.
NEUROLOGICAL MECHANISMS IN EPILEPSY AND BEHAVIOR,
by Jose M. R. Delgado. Annual progress rept., 15 Apr 60-15 Apr 61. 20 Apr 61, 13p. 11 refs.
(Contract Nonr-60908)
Unclassified report

DESCRIPTORS: *Epilepsy, Behavior, Brain, *Neurology, Physiology, *Tranquilizing drugs, Stimulation, Primates, Electrical properties, Digestive system, Stomach, Cerebral cortex, Cannulation, Electrodes, Circulatory system, Electroencephalography, Emotions, Drugs.

Methods for remote controlled stimulation of the brain described in the literature are unreliable, mainly because intensity of stimulation changes if the orientation of the receiving antenna is modified by animal movements. Also, the monitoring of stimulation is often difficult. These problems, as well as others, seem to be solved by a new method for radio-controlled electrical stimulation of the brain. A study was begun of cerebral-gastrointestinal correlations. In a group of seven monkeys, cannulas were permanently implanted in the stomach, and multilead electrodes permanently implanted in the brain. Some of the control studies, as well as the reactions after histamine injection seemed to indicate that gastrointestinal functions in the Macaca Mulatta are similar to those in human beings, and different from those in other experimental animals, such as cats and dogs. The study of aminophenylpyridone was continued with a derivative named carbomethoxy-aminophenylpyridone, which produces interesting behavioral disassociation with simultaneous drowsiness and increased aggressiveness. Considerable modification of the electrical activity of the brain was recorded over a wide area of the cerebral cortex, while the activity was only slightly modified in some of the limbic structures. (Author)

AD-256 364 Div. 16, 15
(22 May 61) OTS price $1.10

Johns Hopkins U. School of Engineering, Baltimore, Md.
REPRESENTATION AND ANALYSIS OF SIGNALS. PART VIII. REPRESENTATION OF ELECTROCARDIOGRAM BY ORTHOGONALIZED EXPONENTIALS,
by T. Y. Young and W. H. Huggins. 21 Mar 61, 9p. incl. illus.
(Contracts Nonr-24853 and AF 19(604)1941)
(AFCRL-187) Unclassified report

DESCRIPTORS: *Electrocardiography, Signals, Special functions, Numerical analysis, Wave analysis, Vector analysis.

Electrocardiography has proved to be a useful diagnostic aid for physicians. There is a growing interest in the statistical study of electrocardiograms. A prerequisite for this is to transform the analytic ECG waveform efficiently into a numerical representation. In this paper, a method is given for characterizing each ECG waveform by a few numbers. We show that a typical ECG waveform may be expressed as the sum of a small set of exponential components, the amplitude of which describe the signal vector in an orthogonal signal space. Thus each entire ECG wave corresponds to a single fixed vector in this abstract signal space. This compact numerical representation may be used for further statistical study and analysis. The instrumentation for measuring the coordinates of these signals on an orthogonalized exponential basis will be described and experimental results given showing the accuracy achieved by ten to twenty components. The orthogonal signal space representation may be used to express the vectorcardiographic idea. Ordinarily, vectorcardiograms are projected in xy, yz and zx planes. By means of the well-known eigenvalue process, we were able to find the major loop of QRS complex and the plane on which it lies. The eigenvectors calculated in this way may, if we wish, provide a basis for ECG comparison instead of the conventional x, y, z components. (Author)

AD-256 373 Div. 16, 1, 28
(23 May 61) OTS price $3.60

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
HUMAN FACTORS RESPONSES DURING GROUND IMPACT,
by Robert N. Headley, George Lokatos and others. Rept. on Biophysics of Flight. Nov 60, 30p. incl. illus. tables, 10 refs.
(Proj. 7222)
(WADD TR 60-590) Unclassified report

DESCRIPTORS: Biophysics, Flight testing, *Human engineering, *Acceleration tolerance, Flight simulators, *Impact shock, Deceleration, Space medicine, Space capsules, *Spaceship seats, Velocity, Vibration isolators, Safety belts, *Safety harness, Design, *Jettisonable cockpits, *Aviation medicine.

Forty-six vertical impact experiments were conducted using a simulated B-70 escape capsule and eleven seated human subjects (Az). Three drops are reported. Impact velocities ranged from 9.8 to 30 ft/sec.; a crushable paper honeycomb material was the impact attenuator. Three restraint systems were tested. Accelerometer data revealed mean rates of onset of deceleration as high as 1620 g/sec. with max g-loads to 35 g. The only noteworthy finding of pre- and post-test clinical examinations was one case of microscopic hematuria lasting one month. The conclusion was that impact decelerations of 24 g with a velocity change of 30 ft/sec. and a 500 g/sec. rate of onset can be tolerated by using a proper body restraint system, good upper torso support, proper torso and neck positioning, and by eliminating all possible elastic recoil components. (Author)

AD-256 378 Div. 16, 1
(22 May 61) OTS price $1.10

Air Crew Equipment Lab., Naval Air Material Center, Philadelphia, Pa.
THEORY ON THE MECHANISM OF VERTEBRAL INJURIES SUSTAINED ON EJECTIONS FROM AIRCRAFT,
by R. A. Bosee and C. F. Payne, Jr. 1961. 15p. incl. illus.
Unclassified report

To be presented at the meeting of the Aerospace Medical Panel of the Advisory Group for Aeronautical Research and Development, NATO, April 10-14, 1961.

DESCRIPTORS: *Spine, *Injuries, Ejection, *Ejection seats, Aircraft seats, Acceleration.

Vertebral injuries result from the concentration of ejection force on the front of the vertebral bodies. This is brought about by spinal flexion, the major causes of which are thought to be: (1) the deviation of ejection and vertebral axes; and (2) forward leverage of the pelvis by the inertia of the legs. If the body must be supported by the spinal column during ejection, it is important to maintain: (1) The normal vertebral alignment; (2) The normal spinal axis; and (3) Parallel ejection and vertebral axes. This will result in good body posture and therefore good force distribution on the weight-bearing portions of the vertebrae. (Author)

AD-256 384 Div. 16
(22 May 61) OTS price $3.60

North American Aviation, Inc., Los Angeles, Calif.
HUMAN TOLERANCE TO ACCELERATIONS: A PRACTICAL TOOL FOR THE ENGINEER,
by J. F. Hegenwald, Jr. and S. Oishi. 6 May 57, rev. 13 June 57, 30p. incl. illus. (Rept. no. NA-57-425)

Unclassified report

Presented on May 6, 1957, at the 28th Annual Meeting of the Aero Medical Association, Denver.

DESCRIPTORS: *Acceleration tolerance, Human engineering, *Physiology, Aviation medicine, Man, Blackout (Physiology), Test methods, Injuries.

AD-256 393 Div. 16
(19 May 61) OTS price $1.60

Naval Medical Research Inst., Bethesda, Md.
EPIDEMIOLOGY AND PREVENTION OF BACILLARY DYSENTERY,
by Thomas M. Floyd. 16 Dec 60, pp. 269-283, incl. table, 89 refs. (Lecture and Review series no. 60-8)

Unclassified report

DESCRIPTORS: *Shigella infections, Control, Epidemiology, Etiology, Diagnosis, Disease carriers, Preventive medicine, Antibiotics, Sulfonamides.

From experiments, it is evident that outbreaks of bacillary dysentery can be limited by prophylactic use of sulfonamides and antibiotics. However, it would be far preferable to control infection by some method other than essentially treating individuals at risk. At the moment it would appear that constant attention to high standards of hygiene and sanitation is the only effective method of control. However, it is to be hoped that eventual delineation of factors involved in pathogenesis will permit a satisfactory means of immunization to be developed. (Author)

AD-256 394 Div. 16
(19 May 61) OTS price $1.60

Naval Medical Research Inst., Bethesda, Md.
THE INFLUENCE OF VARIOUS METABOLITES ON THE GROWTH OF COXIELLA BURNETTI IN MONOLAYER CULTURES OF CHICK EMBRYO ENTODERMAL CELLS,
by Virginia L. Blackford. 21 Nov 60, vol. 18, pp. 621-630, incl. illus. tables. (Rept. no. 1) (Proj. MR 005.09-1200.04)

Unclassified report

DESCRIPTORS: *Tissues (Biology), Embryos, Culture, Growth, Reaction kinetics, Metabolism, Culture media, *Rickettsia.

The factors influencing the growth of Coxiella burnetti in chick embryo entodermal cell monolayers were investigated. The methods of preparation and infection of the cultures and determination of extent of rickettsial growth were similar, but somewhat simpler than those reported by Weiss and Pietryk (1956). The addition of Morgan's mixture 199 or the constituents of Eagle's medium to a basal medium composed of untreated chicken serum and Hanks' BBS significantly inhibited rickettsial growth. The amino acids and glutamine of Eagle's medium proved to be the inhibitory factors. Rickettsial growth was also greatly depressed in the absence of serum or in the presence of dialyzed or chloroform-treated serum. The addition of individual metabolites produced variable results. Pyruvate yielded rather consistent results. Enhancement or inhibition was obtained within a very small range of concentrations, 2.5 to 0.75 mM enhancing and 10 mM usually inhibiting. Glucose did not affect the growth of the rickettsiae or influence the enhancing effect of pyruvate. In one experiment DPN was inhibitory in concentrations 0.1 and 0.05 mM but enhancing at 0.025 mM. Although somewhat similar results were obtained with ATP and CoA this effect has not been reproducible. (Author)

AD-256 395 Div. 16
(19 May 61) OTS price $1.60

Naval Medical Research Inst., Bethesda, Md.
THE CULTIVATION OF DENGUE-1 (HAWAIIAN) VIRUS IN TISSUE CULTURE. III. CYTOPATHOGENIC VIRUS SUB-CULTURED FROM HuS 2806-DENGUE-1 CARRIER CULTURE,
by N. H. Wiebenga and I. E. Fishburne. 4 Nov 60, Vol. 18, pp. 551-562, incl. illus. tables. (Rept. no. 4) (Proj. MR 005.09-1200-01)

Unclassified report

DESCRIPTORS: *Viruses, *Tissues (Biology), Culture, *Cells (Biology), Skin, Kidneys, Growth, Titration, Adsorption.

Dengue-1 virus has been maintained in human skin cell carrier culture for 2 years. Subsequent to continuous propagation for 15 months, a variation in the cytopathogenicity was observed, viz., the regular production of an acute cytopathic effect (CPE) associated with infection of human skin (HuS 2806) and monkey kidney (MKE) cell cultures, in contrast with the lack of any significant CPE when similar cultures were infected with the mouse-adapted virus. In cultures of either cell type a minimum of 10 to 14 hr contact time between cells and virus was necessary for maximum infectivity as measured by CPE. Using CPE as the indicator, virus titrations of infectious fluids were completed in 5 days with HuS 2806, and in 10 days with MKE cell cultures. The association of CPE with virus reproduction was shown in two ways. Using suckling mice for assay the growth curves of cell-adapted virus showed peak titers of 10 to the 4th power mouse LD50 in HuS 2806 cell cultures after 78 hr, and 10 to the 5th power mouse LD50 in MKE cell cultures after 125 hr, corresponding with the development of CPE in each case. Using both mice and tissue cultures to assay numerous harvests and pools of tissue culture fluid containing up to 10 to the 7th power infectious units, the titration endpoints for CPE (TC CPD50) were comparable to the mouse LD50 endpoints of duplicate samples. (Author)

Division 16 - MEDICAL SCIENCES

AD-256 396 Div. 16
(19 May 61) OTS price $1.10

Naval Medical Research Inst., Bethesda, Md.
THE EFFECT OF SOME KREBS CYCLE INHIBITORS AND INTERMEDIATES ON SHIGELLA INFECTIONS IN MICE,
by Thomas M. Floyd and Robertson B. Clark.
4 Nov 60, Vol. 18, pp. 615-620, incl. tables, 11 refs. (Rept. no. 5)
(Proj. MR 005.09-1100.01)
Unclassified report

DESCRIPTORS: *Shigella infections, *Shigella, Inhibition, *Enzymes, *Metabolism, Malonic acids, Citrates, Succinates, Injection, Arsenic compounds, Intestine, Survival.

Recent reports have indicated that injection of substances inhibitory to enzymes of the tricarboxylic acid cycle, or of intermediate products of this cycle, would decrease survival time of mice challenged with a variety of organisms. Groups of mice were inoculated rectally with Shigella flexneri 3 organisms and then injected parenterally with one of the following: disodium malonate, sodium arsenite, trisodium citrate, disodium succinate. Control groups were given either organisms alone, tricarboxylic acid (TCA) cycle inhibitors or intermediates alone, or these compounds heat-killed organisms. Within 72 hours S. flexneri 3 organisms alone killed 4 (5.0%) of 80 mice. In combination with malonate they killed 15 (75%) of 20, with citrate 10 (50%) of 20, with succinate 8 (40%) of 20, and with arsenite, 8 (40%) of 20. There were no deaths among 80 mice inoculated with heat-killed organisms alone. Among those that received heat-killed organisms plus inhibitors or intermediate, 3 (15%) of 20 injected with malonate died, 6 (30%) of 20 with citrate, 0 of 20 with succinate, and 2 (20%) of 10 with arsenite. There was no evidence of diarrhea in surviving animals. Shigella were recovered less often from mice injected with malonate, citrate or succinate and more often from those that received arsenite than from controls inoculated with organisms alone. (Author)

AD-256 397 Div. 16
(22 May 61) OTS price $1.60

Naval Medical Research Inst., Bethesda, Md.
COMPARISON OF MATING AND BITING BEHAVIOR IN TWO LABORATORY STRAINS OF ANOPHELES QUADRIMACULATUS SAY,
by Nathan Stahler and Leven A. Terzian. 16 Dec 60, Vol. 18, pp. 641-652, incl. illus. tables. (Rept. no. 5)
(Proj. MR 005.09-1401-01)
Unclassified report

DESCRIPTORS: *Mosquitoes, *Insect bites, Reproduction, Sex, Behavior.

In order to assemble some evidence of possible physiological differences which might have developed among laboratory strains of Anopheles quadrimaculatus Say, and which might lead to biological segregation, a colony from Wilson Dam, Alabama, was compared in detail with another from Bethesda, Maryland. Significant divergence was found in sexual activity, in that the former group mated at lower rates and exhibited a mid-winter sexual diapause. The males of both laboratory strains tended to mate with females of their own origin. Biting rates on guinea pigs and chickens were also markedly different, the Wilson Dam groups again being less active. In the third year of studies, the two strains converged in these behavior patterns. No significant differences were found in other aspects of life history and morphology. (Author)

AD-256 398 Div. 16
(22 May 61) OTS price $1.10

Naval Medical Research Inst., Bethesda, Md.
FURTHER OBSERVATIONS ON KETONE BODY AND FATTY ACID OXIDATION BY DIAPHRAGM FROM NORMAL RATS AND RATS FASTED IN A COLD ENVIRONMENT,
by E. M. Neptune, Jr., W. W. Shreeve, and F. J. Fash. 4 Nov 60, Vol. 18, pp. 533-538, incl. tables. (Rept. no. 11)
(Proj. MR 005.12-1100.02)
Unclassified report

DESCRIPTORS: *Tissues (Biology), *Muscles, *Fatty acids, *Ketones, Carbon dioxide, Labeled substances, Oxidation, Exposure.

The minimal calculated percent of C02 of excised rat diaphragm produced from C14-ethyl acetoacetate, C14-sodium beta hydroxybutyrate and C14-sodium palmitate was determined using tissue from normal rats and from rats starved for 24 hours in a 4 C. environmental temperature. There was no marked difference between the normal fed animal and the cold-starved animal under the conditions of these experiments. Unlabeled glucose did not augment the oxidation of labeled palmitate by diaphragm from either the normal or cold-starved animal. Acetoacetate is more extensively converted to C02 than is beta hydroxybutyrate. When both substrates are present as a mixture, acetoacetate contributes twice as much to the C02 as does beta hydroxybutyrate. The marked depression of C1402 from labeled palmitate when unlabeled acetoacetate is present, is consonant with the theory that labeled palmitate mixes with the intracellular source of C02 and that the minimal calculated percent of C02 in the case of labeled palmitate is much lower than true value for contribution of palmitate to the C02. (Author)

AD-256 399 Div. 16
(19 May 61) OTS price $1.60

Naval Medical Research Inst., Bethesda, Md.
FURTHER TOXICOLOGICAL PROPERTIES OF AROMATIC ESTERS IN THE TROPINE AND PSI-TROPINE SERIES,
by S. L. Friess, R. C. Durant, and W. C. Thomsen. 16 Dec 60, Vol. 18, pp. 631-640, incl. illus. table. (Rept. no. 20)
(Proj. MR 005.06-0010.01)
Unclassified report

DESCRIPTORS: *Tissues (Biology), Toxicity, *Alkaloids, Esters, *Esterases, Nerves, Pharmacology, *Acetylcholines, Isomers, Inhibition, *Cholinesterase, Nervous system.

The anticholinesterasic inhibitory potencies of the diphenylacetate and o-chlorophenylacetate esters of tropine and psi-tropine have been evaluated with an esterase preparation from electric eel tissue. As a class, these aryl esters are weak-to-moderate inhibitors of the acetylcholinesterase-acetylcholine system, with both of the diphenylacetates acting by a non-competitive process and contrasting with the competitive mode of action on the part of psi-tropine-o-chlorophenylacetate. The esterase shows stereospecific differentiation between tropine and psi-tropine ester configurations, with psi-structure (cis orientation of polar groups) the more potent in each ester pair. The tertiary o-chlorophenylacetate esters are powerful convulsants and paralysants in the mouse and cat, with additional mydriatic action reminiscent of the classical esters atropine and scopolamine. Clear stereochemical differentiation between the isomeric chloro esters, on the LD50 basis, essentially vanishes in the intact animal toxicity results. (Author)

AD-256 406 Div. 16
(19 May 61) OTS price $1.10

Armour Research Foundation, Chicago, Ill.
PURGING STUDY,
by Sol Miller. 6 Jan 61, 4p. incl. illus.
(Contracts DA 18-064-404-cml-353 and DA 18-064-cml-2747)
Unclassified report

DESCRIPTORS: Aerosols, *Bacterial aerosols, *Aerosol generators, Plastics, Containers, Purification, Tests, Effectiveness.

The objective of this test was to determine the efficiency of purging in the plastic capsule. The criterion for a safe level of aerosol concentration after purging is two logs lower than the first time period aerosol recovery. The results of this test indicate that with BG as the test organism and a 2 min cloud concentration of approximately 3 x 10 to the 7th BG/liter of air, an aerosol concentration at least 3 logs lower was obtained after 10 min of purging. (Author)

AD-256 416 Div. 16
(22 May 61) OTS price $1.60

School of Aviation Medicine, Brooks Air Force Base, Tex.
SERUM AND PAROTID FLUID UREA-LEVELS IN UREA-LOADED HEALTHY YOUNG ADULTS,
by Ira L. Shannon and John R. Prigmore. Feb 61, 10p. incl. illus. tables, 14 refs. (Rept. no. 61-33)
Unclassified report

DESCRIPTORS: *Salivary glands, Nitrogen, *Urea, Determination, Serum, *Saliva, Blood plasma, Test methods.

Forty-four healthy young adult male subjects were given oral doses of urea, and parotid fluid and serum urea levels were studied for 1 to 3 hours. A highly significant correlation between urea in serum and in parotid fluid (r equals 0.982) was found. The indication was that, with flow rate carefully controlled, parotid fluid could be used interchangeably with serum in urea determination, regardless of the magnitude of the blood concentration. (Author)

AD-256 417 Div. 16, 20
(22 May 61) OTS price $1.10

School of Aviation Medicine, Brooks Air Force Base, Tex.
EFFECTS OF POSTIRRADIATION CHRONIC COLD STRESS ON IRRADIATED RATS,
by J. J. Gambino, M. S. Billings and others. Feb 61, 6p. incl. tables, 17 refs. (Rept. no. 61-50)
Unclassified report

DESCRIPTORS: *Adrenal glands, Physiology, *Tumors, *Exposure, *Radiation tolerance, X-rays, Survival, Rats, Adrenal cortical extract, Stress (Physiology), *Radiation effects.

The present experiment was designed to elucidate the possible role of the adrenal gland in the late-radiation-effects syndrome. Whole-body irradiated, adrenal irradiated, and non-irradiated rats were observed and compared with regard to longevity, body weight, cataract induction, tumor formation, and other delayed manifestations of sublethal irradiation. An attempt was made to accentuate any hypothetic mild adrenal dysfunction that might exist in the post irradiated rats, by planned exposure to a series of environmental stress situations. Systematic exposure of irradiated and control rats to chronic intermittent cold stress was initiated. Results showed there was no significant difference in longevity or time of appearance of external neoplasms when any of the cold stressed groups were compared with their noncold stressed controls. (Author)

AD-256 500 Div. 16
(23 May 61) OTS price $6.60

Miami U., Coral Gables. School of Medicine.
MICROWAVE RADIATION RESEARCH,
by William B. Deichmann. Annual rept. 31 Dec 60, 66p. incl. illus. tables, 22 refs.
(Contract AF 30(602)1753, Proj. 5545)
(RADC TR 61-42) Unclassified report

DESCRIPTORS: *Microwaves, *Radiation effects, Radiofrequency generators, Magnetrons, *Medical research, Radiation hazards, Leukemia, *Pathology, Heart, *Pharmacology, *Anatomy, Blood, Temperature, Radiofrequency power, Dogs, Rats, Endocrine glands, X rays, Testes, Heat, Test facilities, Chickens, Electrocardiography.

Contents:
Organ temperature studies
The effect of microwave radiation of 10 mw/sq cm in the treatment of experimental leukemia
Chronic (intermittent) exposure of experimental animals to microwave radiation
Chronic exposure of beagle dogs to microwave radiation of 20 mw/sq cm
The effects of microwave irradiation on the embryonic chick heart as revealed by electrocardiographic studies
The effect of microwave radiation on the male endocrine system of the rat

AD-256 585 Div. 16, 20
(25 May 61) OTS price $2.60

Albert Einstein Medical Center, Philadelphia, Pa.
RESPONSE OF RADIATED ANIMALS TO ANESTHETICS AND ANALGETICS,
by Howard L. Zauder and Louis R. Orkin. Rept. for 1 July 60-30 June 61, 30 June 61, 1v. incl. illus. tables.
(Contract DA 49-007-md-962)
Unclassified report

DESCRIPTORS: *Anesthetics, Barbiturates, *Analgesics, Sensitivity, *Radiation effects, Chromatographic analysis, Quantitative analysis, Pathology.

It has been established that prior exposure to ionizing radiation increases the sensitivity of mice to the effects of the commonly employed anesthetic agents. In almost all cases, and at almost all levels of radiation, the increase in mortality following anesthesia is statistically significant. While there is no question that divinyl ether is the most offensive agent and cyclopropane the least offensive agent in this regard, there is little to choose from as far as other anesthetics are concerned. Other than for these two anesthetics, there is no statistically significant difference among the anesthetics. It must be remembered, however, that this data was accumulated with a fixed dose of anesthetic agent. We have previously

reported a failure to observe any gross pathological changes in radiated animals that were anesthetized as opposed to those radiated animals that did not receive anesthesia. A review of the microscopic sections taken from these animals failed to reveal any differences between the two groups. Extension of this work to larger animals required the development of an analytical technique for rapid quantitation of anesthetic agents. Gas chromatography proved to be the method of choice for analysis of both anesthetics and respiratory gases. The report deals with the adaptation of this technique in some detail. (Author)

AD-256 638 Div. 16
(26 May 61) OTS price $1.10

Maryland U., College Park.
RESEARCH ON NEUROPATHOLOGICAL EFFECTS OF MILITARY CHEMICALS,
by Russell S. Fisher. Semiannual rept. 1 Oct 60-31 Mar 61. 17 Apr 61, rev. 25 May 61, 3p. table.
(Contract DA 18-108-405-cml-754)
Unclassified report

DESCRIPTORS: *Carbon dioxide, Pathology, Survival, Respiration, Anoxia, *Poisoning, Electrocardiography, Electroencephalography, Hemoglobin, Determination, Brain, Spinal cord, Heart, Blood circulation.

The main purpose of the work is to re-examine which concentration of CO in the air can be tolerated by healthy individuals for a prolonged period of time without producing permanent organic damage. The first step consisted of single exposures of various length to different concentrations of CO under the best possible control of physiological reactions in order to gain a better insight into the mechanism of the lesions. The second step is planned to consist of long term exposures of groups of animals to CO concentrations critical for the occurrence of permanent damage and below such level. The exposures are planned to be of continuous as well as interrupted type. Studies were made on single exposures to CO of various concentrations and of various durations. For the matter of comparison, some animals were exposed to oxygen deficiency equivalent to certain levels of CO hypoxia. Information for each experiment as to the concentration of CO or O2, the duration of exposure, the maximum CO saturation in the blood during the experiment, the survival time and the absence or presence of pathologic tissue alterations is tabulated. (Author)

AD-256 656 Div. 16
(26 May 61) OTS price $1.10

New York U. Coll. of Medicine, N. Y.
STUDIES ON THE ETIOLOGY OF EXPERIMENTAL SHOCK,
by B. W. Zweifach and A. Janoff. Progress rept. 1 May 60-30 Apr 61. 5 May 61, 4p.
(Contract DA 49-007-md-993)
Unclassified report

DESCRIPTORS: *Traumatic shock, Production, Arteries, Obturation, Bacterial toxins, Serotonin, Blood, Iron compounds, Etiology, Reticulo-endothelial system, Metabolism, Hemorrhage.

Contents:
Passive transfer of a lethal factor in blood of rabbits shocked by occlusion of the superior mesenteric artery (SMA)
Evidence against bacterial endotoxin as the lethal factor in blood during SMA-occlusion shock
Biological effect of elevated serotonin levels in SMA occlusion shock blood
Pathogenesis of experimental shock
Detoxifying function of the reticuloendothelial system

AD-256 660 Div. 16
(26 May 61) OTS price $1.60

Hammersmith Hospital, London (Gt. Brit.).
FUNCTION OF THE HUMAN ADRENAL CORTEX,
by C. L. Cope. Final technical status rept. 1 Mar 60-28 Feb 61. 28 Feb 61, 14p. incl. tables.
(Contract DA 91-591-EUC-1407)
Unclassified report

DESCRIPTORS: *Adrenal glands, Physiology, *Aldosterone, Secretion, Metabolism, Metabolic products, Hypertension, Kidneys, Pathology, Heart, Electrolytes (Physiology), Corticosteroids, Tritium, Excretion.

Information was collected not only on aldosterone secretion rates in man but also on the output of the main metabolite in the urine. The normal range for secretion rate and metabolite excretion have been established. A series of cases of hypertensives has been studied, and also a series of congestive cardiac failure subjects resistant to normal therapy. Cases of hypertension have been encountered which showed high aldosterone secretion and attempts are being made to determine the factors deciding whether aldosterone secretion is raised in hypertension or not. Two cases of hyperaldosteronism have been studied and both had the expected high aldosterone secretions. The effect of impaired renal function on the estimation of aldosterone secretion rates is also being studied. The diagnostic value ot determination of aldosterone secretion rates is being gradually defined. (Author)

AD-256 708 Div. 16
(29 May 61) OTS price $1.10

South Dakota U. School of Medical Science.
EFFECT OF OXYGEN INHALATION ON MANUAL PERFORMANCE IN THE COLD,
by D. M. MacCanon. Annual progress rept. for 1 Oct 59-30 Apr 61. 5p. incl. tables, 10 refs.
(Contract DA 49-007-md-1008)
Unclassified report

DESCRIPTORS: *Exposure, *Oxygen consumption, Respiration, Hands, Cooling, Shivering, Motor reactions, Labor, Effectiveness, Sensory perception, Reaction kinetics, Tactual perception.

The effects of oxygen inhalation on manual performance at room temperatures, and after hand cooling were determined in 12 subjects. Oxygen significantly increased manual performance by similar amounts under both conditions. The interpretation is that O2 and hand cooling affect different elements. Thus, their effects on manual performance are not related. (Author)

AD-256 727 Div. 16
(29 May 61) OTS price $2.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
SOME PHYSIOLOGICAL CHANGES OBSERVED IN HUMAN

SUBJECTS DURING ZERO G SIMULATION BY IMMERSION IN WATER UP TO NECK LEVEL,
by Edw. L. Beckman, K. R. Coburn and others.
Rept. no. 1. 10 April 61. 23p. incl. illus. tables (Rept. no. NADC MA 6107)
(Task no. MR005.13-005.7)
Unclassified report

DESCRIPTORS: *Weightlessness, Space flight, Man, Physiology, Sensory perception, Tests, Respiration, Atmosphere, *Space medicine, *Pressure breathing, Acceleration tolerence, Water, Simulation.

Knowledge relative to the effects of prolonged weightlessness is needed in preparing man for space flight. The buoyant force exerted upon immersed bodies effectively simulates the weightless state with respect to proprioceptive sensory responses and perhaps in other ways. An investigation into the physiological effects of immersing subjects in water up to neck level was undertaken. A series of experiments involving 7 subjects immersed in water up to neck level for periods of 5 to 23 hours (5 subjects for 12 hours) showed a significant weight loss during the period of immersion, which was explained by the diuresis which occurred. Pulmonary volume measurements showed a decrease in the expiratory reserve volume and in the respiratory minute volume during immersion. There was no significant decrement in the performance of a tracking task, attributable to the water immersion, during exposure to a simulated space vehicle reentry deceleration profile. Exposure to 4.5 positive G for 15 seconds following water immersion revealed a decrement in tolerance in most subjects. (Author)

AD-256 734 Div. 16
(31 May 61) OTS price $1.10

Rochester U. School of Medicine and Dentistry, N. Y.
STUDIES ON METABOLISM AND MECHANISMS OF DESTRUCTION OF THE FORMED ELEMENTS OF THE BLOOD,
by Scott N. Swisher and Lawrence E. Young.
Progress rept. 1 Feb 60-31 May 61. 31 May 61, 7p.
(Contract DA 49-007-md-632)
Unclassified report

DESCRIPTORS: *Erythrocytes, *Blood plasma, *Blood, *Metabolism, *Phospholipids, Lipids, Glucose, Biosynthesis, Linoleic acid, Mercury, Primaquine.

Dialyzable plasma phosphorous is not incorporated into erythrocyte lipids. Plasma phospholipids emulsified in aqueous media by ultrasonic vibration are incorporated into the erythrocyte lipids at the same rate that they are incorporated from whole plasma. Influx of lipid phosphorous from plasma is greatly increased over normal when erythrocytes stored in ACD solution at 4 C. for less than 4 wk are then incubated at 37 C. Erythrocytes from patients with Hereditary Spherocytosis show rapid alterations in the membrane lipids upon in vitro incubation. Plasma and erythrocytes from patients with Acanthocytosis show marked reductions in their content of lecithin and linoleic acid. In vivo removal mechanisms, in addition to the metabolic defect, are essential in producing hemolytic anemia in subjects with glucose-6-PO4 dehydrogenase deficiency. Erythrocyte calcium may exist in an easily exchangeable pool (30%) and a slowly exchangeable pool (70%). Single intravenous administration of EDTA (200 mg/kg.) produces vacuolar changes of renal proximal tubule epithelium in the dog. (Author)

AD-256 794 Div. 16, 4
(29 May 61) OTS price $1.60

Army Medical Research and Nutrition Lab., Denver, Colo.
THE INFLUENCE OF CHOLESTEROL ON THE DETERMINATION OF SERUM GLYCERIDES,
by G. A. Leveille, J. W. Shockley, and H. E. Sauberlich. 20 Feb 61, 10p. incl. illus. tables
(Rept. no. 255)
(Proj. 6-60-11-001)
Unclassified report

DESCRIPTORS: *Serum, *Glyceric acids, Determination, *Cholesterol, *Esters, Glycerols, Fatty acids, Biochemistry, Colorimetric analysis, Phospholipids, Adsorption, Chromatographic analysis, Silicic acids, *Lipids, Test methods, Chloroform.

The development of a direct method for the determination of serum glycerides has increased the accuracy of this determination. However, the influence of interfering substances has received little attention. Since a lipid extract is employed, the only interfering substances would be lipid in nature, i.e., cholesterol and fatty acids. Cholesterol has been shown to interfere with the color development in the direct procedure. A chloroform extraction has been introduced in the procedure which removes cholesterol and fatty acids, thereby preventing any interference from these compounds. (Author)

AD-256 795 Div. 16, 9, 29
(29 May 61) OTS price $1.60

Army Medical Research and Nutrition Lab., Denver, Colo.
PHYSIOLOGICAL BASIS OF FLOATING IN WATER,
by R. W. Allard, K. S. K. Chinn and others.
22 Feb 61, 18p. incl. illus. tables, 18 refs.
(Rept. no. 256)
(Proj. 6X60-11-001)
Unclassified report

DESCRIPTORS: Body fats, Swimming, *Floating bodies, Respiration, Lungs, Body weight, Tissues (Biology), Air, Buoyance recorder, Materials, *Flotation, Measurement, Volumetric analysis, Loading, Water, Man, *Physiology, Volume.

Specifications are derived for the volume of air necessary to float men with their heads out of water to the level of the first thoracic vertebrum. The derivation is based on (a) proportions of body fat, (b) its density and (c) that of the lean body mass together with (d) residual lung volumes. In order to float all body types of men, including large lean men, 11.6 liters of submerged air are believed necessary. It is shown that loading with wet clothing and typical weapons can increase this requirement to upwards of 23 liters of air. (Author)

AD-256 796 Div. 16
(29 May 61) OTS price $1.10

Army Medical Research and Nutrition Lab., Denver, Colo.
PURIFICATION OF ANTIFOAM A FOR USE IN PUMP OXYGENATORS,
by Robert W. Thomassen and Ronald G. Weigand.
11 Apr 61, 4p. incl. table (Rept. no. 257)
(Proj. 6-60-11-001)
Unclassified report

DESCRIPTORS: *Artificial heart, Silicones, *Foaming inhibitors, Surface tension, Polymers, Silicon compounds, Dioxides, Embolism, Particles, Separation, Centrifuges, Purification, Preparation.

In view of the belief that the particulate matter in Antifoam A is a source of embolism in patients subjected to extracorporeal perfusion, a defoaming agent free of particulate matter can be prepared by high speed centrifugation of whole Antifoam A. (Author)

AD-256 805 Div. 16, 20
(29 May 61) OTS price $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
SOME CRITICAL OBSERVATIONS CONCERNING THE HANDLING OF HIGH LEVELS OF TRITIUM RADIOACTIVITY,
by B. E. Vaughan and A. K. Davis. 17 Apr 61, 15p. incl. illus. tables. (Research and Development rept. no. NRDL-TR-505)
Unclassified report

DESCRIPTORS: *Tritium, Radioactivity, Skin, Radioactive isotopes, *Radiological physics, *Contamination, *Radiation hazards, Hazards.

The data presented demonstrate substantial nonvolatile transfer of tritium from contaminated surfaces to skin by direct contact. Since radioactivity on the contaminated surfaces is not necessarily detectable by gas-flow monitoring methods, this route of entry of tritium into body tissue must be considered an unrecognized, potential hazard, where the handling of apparatus exposed to high levels of tritium is concerned. The lability of contact-transferred tritium in skin, its chemical form and location within the skin, and the exact radioactivity content of the contaminated surfaces are particular problems remaining to be established by exact methods. (Author)

AD-256 806 Div. 16
(29 May 61) OTS price $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
WATER CONSUMPTION OF THE AGEING SPRAGUE-DAWLEY MALE RAT.
by G. K. Osborn, D. C. Jones, and D. J. Kimeldorf. 24 Apr 61, 16p. incl. illus. table, 12 refs. (Research and development rept. no. NRDL-TR-506)
Unclassified report

DESCRIPTORS: *Water, Consumption, *Thirst, Age factors, Measurement, Rats.

In a study of water consumption of the rat as a function of age, 3-day measurements were taken at 6-month intervals from three months of age until death. A remarkable increase in consumption was observed to occur in many animals during the last six months of life span. The magnitude of the abrupt change was increased as a function of age at measurement and appeared to be unrelated to food consumption or changes in body weight. It is thus believed to reflect a disease process related to ageing. Excessive water consumption values were reflected by a considerable increase in the mean and variability of water consumption values of the total population whose consumption otherwise showed only a gradual increase with age. (Author)

AD-256 808 Div. 16
(29 May 61) OTS price $1.10

Texas U. Medical Branch, Galveston.
FUNDAMENTAL NEUROANATOMY AND EMBRYOLOGY OF THE PORPOISES,
by John G. Sinclair. 23 May 61, 5p.
(Contract Nonr-335500, Proj. NR 104-540)
Unclassified report

DESCRIPTORS: *Cetacea, Embryos, Brain, *Nervous system, Collecting methods, Anatomy.

AD-256 859 Div. 16
(1 June 61) OTS price $1.60

North Carolina U. School of Medicine, Chapel Hill.
HYPOTHERMIA AND BLOOD FLOW THROUGH SKELETAL MUSCLE,
by Lloyd R. Yonce. Progress rept. for 1 Sep 60-31 Aug 61. 25 May 61, 15p. incl. illus. tables.
(Contract DA 49-007-md-1002)
Unclassified report

DESCRIPTORS: *Muscles, *Hypothermia, Body temperature, Oxygen consumption, Circulatory system, *Blood circulation.

The general purpose of this study is to determine the vascular response of an isolated gracilis muscle to hypothermia. Data are presented on three pertinent aspects of this problem: (1) the effect of the rate of lowering the temperature on the vascular response of the isolated gracilis muscle, (2) the effect of hypothermia on the oxygen consumption of the resting isolated muscle, and (3) the effect of hypothermia on the reactivity of the vasculature of the isolated muscle. (Author)

AD-256 877 Div. 16
(29 May 61) OTS price $1.60

Public Health Service, Washington, D. C.
(No title)
by R. L. Bunch. Research quarterly progress rept. 16 Jan-15 April 61. 15 Apr 61, 15p.
(Contract PH 6-404-4982)
Unclassified report

DESCRIPTORS: Cellulose chemistry. Ion exchange resins, *Soils, Adsorption, *Antigens, Carbon, Absorption.

Field samples, C3 and D3, were compared with previous standards C2 and D2 for antigen content. The new standards contained essentially the same amount of antigenic activity. Several cellulose ion exchangers, and Dow ion exchange resins were evaluated for their selectivity in removing the antigenic components from field sample D2. Activated carbon was investigated on the basis that phenol will remove the activity of sample C2 from an aqueous solution and, therefore, it might possibly desorb the antigens from carbon. The feasibility of using ion exchange resin columns in series was investigated. The aim of this method was to increase the efficiency of the borate form of CG-400 resin in river water by first removing interfering substances. Although the yield was not great, this method would offer a means of detection. With an unlimited amount of sample, such as would be encountered in a river, the success of this method would depend upon the performance of the mixed bed exchanger. Some time was devoted to the recovery of antigenic materials from soil. This line of investigation seems profitable because of the natural ion exchange properties of most soils and also the advantage of transporting soil samples. A sample of soil was received from an area known to have been exposed to B. suis and P. tularensis. Of the various elution procedures tried, soaking with distilled water at pH 2.5 was the most successful. (Author)

17. METALLURGY

AD-256 050 Div. 17, 25
(17 May 61) OTS price $1.10

Northwestern Technological Inst., Evanston, Ill.
ACOUSTICAL STUDY OF QUENCH-AGING IN ALPHA CU-AL ALLOYS,
by Theodore J. Koppenaal and Morris E. Fine.
12 Apr 61, 3p. illus. (Technical rept. no. 4)
(Contract Nonr-122811, Proj. 031-618)
Unclassified report

DESCRIPTORS: *Copper alloys, Heat treatment, *Aluminum alloys, *Aging, Single crystals, Resistance, Temperature, *Elasticity, Frequency, *Resonance, Measurement, Acoustics, Crystal structure, Diffusion.

Young's modulus at 21 C in quenched alpha Cu-Al alloys increases with time. This correlates with a decrease in resistivity which has been attributed to vacancy enhanced diffusion and short-range ordering. The total change in modulus during aging increases with Al content and quenching speed and is also a function of the quenching temperature. An effective activation energy of 0.69 ev was determined 38 minutes after quenching. This is an effective energy of motion for the point defects involved in the diffusion process at this point in the reaction. (Author)

AD-256 075 Div. 17, 12
(18 May 61) OTS price $1.00.

National Aeronautics and Space Administration, Washington, D. C.
INVESTIGATION OF THREE ANALYTICAL HYPOTHESES FOR DETERMINING MATERIAL CREEP BEHAVIOR UNDER VARIED LOADS, WITH AN APPLICATION TO 2024-T3 ALUMINUM-ALLOY SHEET IN TENSION AT 400 DEGREES F,
by Avraham Berkovits. May 61, 40p. incl. illus. tables. (Technical note D-799)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-799.

DESCRIPTORS: *Aluminum alloys, Sheets, Tests, *Creep, Stresses, Deformation, Loading, Heat resistant alloys, Heat temperature research, Mathematical analysis, Theory, Temperature, Aircraft, Load distribution, Metals, Tensile properties, Rupture, Hardening, Mechanical properties.

Three existing hypotheses are formulated mathematically to estimate tensile creep strain under varied loads and constant temperature from creep data obtained under constant load and constant temperature. The hypotheses investigated include the time-hardening, strain-hardening, and life-fraction rules. Predicted creep behavior is compared with data obtained from tensile creep tests of 2024-T3 aluminum-alloy sheet at 400 F under cyclic-load conditions. A simplified method of calculating creep strain under varied loads is presented on the basis of an equivalent stress, derived from the life-fraction rule, which reduces the varied-load case to a constant-load problem. Creep strain in the region of interest for structural design and rupture times, determined from the hypotheses investigated, are in fair agreement with data in most cases, although calculated values of creep strain are generally greater than the experimental values because creep recovery is neglected in the calculations. (Author)

AD-256 092 Div. 17
(18 May 61) OTS price $4.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PLASTIC-DEFORMATION RESISTANCE OF HIGH-STRENGTH STEELS UNDER CONDITIONS OF AMBIENT COMPRESSION IN TEMPERATURE RANGE FROM 20 TO 400 DEGREES,
by M. L. Gorb. 26 Oct 60. 45p. (Trans. no. MCL-157 from Issledovaniya V Oblasti Metallovedeniya I Kontaktnoy Prochnosti Metallov, pp. 92-119, 1958)
Unclassified report

DESCRIPTORS: USSR, *Steel, Deformation, Plastic flow, *Plasticity, Stresses, Surfaces, Hardening, Fracture (Mechanics), Mechanical properties, Friction, Machines, Test methods, Tests, Design.

Modern machines, as well as their individual assemblies and parts, perform under conditions of high speeds, temperatures, and pressures. In consideration of these conditions it is necessary to insure the total structural strength and, in particular, the contact strength as well as the wear-resistance of contacting machine parts. The method of testing high-strength steels by the nonuniform volume compression (B. D. Grozin's method) is simple, inexpensive, and sufficiently reliable for appraising their resistivity to plastic deformations which can arise under the actual stress-temperature conditions. Preliminary testing by the nonuniform volume compression method is recommended in assigning the steel of a new brand (by comparison with known brands), and selecting the rational mode of its thermal processing in the production of such machine parts as pendulum bearings, various kinds of gear wheels, and camshaft lobes. The testing temperature should approximate the temperature at which the part will operate. (Author)

AD-256 094 Div. 17
(18 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
NEWS OF THE HIGHER EDUCATIONAL INSTITUTES, NON-FERROUS METALLURGY (SELECTED ARTICLES).
7 Nov 60. 30p. incl. illus. tables, 31 refs. (Trans. no. MCL-245 from Izvestiya Vysshikh Uchebnykh Zavedeniy, Tsvetnaya Metallurgiya, pp. 106-112, 121-128, 1959)
Unclassified report

DESCRIPTORS: *Metallurgy, *Alloys, *Aluminum alloys, Aluminum compounds, Oxides, Chemical impurities, Mechanical properties, Hardness, Density, Deformation, Silicon alloys, *Heat resistant alloys, Tensile properties, Plasticity, Copper alloys, Magnesium alloys, USSR, Stresses.

INFLUENCE OF ALUMINUM OXIDE ON SOME PROPERTIES OF ALUMINUM ALLOYS: The action of Al oxides on the settlement, hardness, and specific gravity of Al alloys with Si was determined. The specific gravity decreased from 2.64 to 2.5 when alloys were polluted with 5.8% oxides. The Brinnell hardness was higher in samples with oxides than in those without oxides. At an even loading, samples with oxides had a smaller settlement than samples without oxides. EXPERIMENT ON HEAT RESISTANCE OF CERTAIN STRAINED ALUMINUM ALLOYS: A study was made of mechanical properties at high temperatures of some strained Al alloys containing large quantities of Mn and Ni. The strongest alloys were those of the type Al-Cu-Mg, with admixtures of Mn. The most heat resistant Al alloy contained 5.5% Cu and small additions of Mn, Zr, and V. At high pressure (12 kg/sq mm) the preferred alloys consisted of Al-Cu-Mg with addition of Mn.

Division 17 - METALLURGY

AD-256 095 Div. 17
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MECHANISM OF METAL CORROSION IN NARROW SLITS AND CREVICES,
by I. L. Rosenfield and I. K. Marshakov. 8 Nov 60. 8p. incl. illus. tables. (Trans. no. MCL-248 from Zhurnal Fizicheskoy Khimii, pp. 411-415, 1959)
Unclassified report

DESCRIPTORS: *Magnesium, *Magnesium alloys, Corrosion, *Corrosion research, USSR, Electrochemistry, Sodium compounds, Chlorides, Hydrogen, Oxygen, Corrosive liquids, Electrolytes.

The corrosion of Mg and its alloys in narrow slits were studied. It was shown that in the majority of cases these metals are subjected to greater corrosion in slits than in electrolytes. The dependence of the velocity of corrosion on the dimension of slits is described by complicated curves characterized by the presence of maxima at certain values of the width of the slit. Intensified corrosion of Mg and its alloys is not caused by O diffusion but chiefly by the bubbles of H mixing the electrolyte. The movements of bubbles prevent the formation of protective films and cause the destruction of existing ones. (Author)

AD-256 100 Div. 17
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
COMPARATIVE INVESTIGATION OF VARIOUS METHODS OF ACTIVATED SINTERING OF REDUCED IRON (Porivnyalne Doslidznennya Riznikh Metodiv Aktivovanogo Spikannya Vidnovlenogo Zaliza)
by R. A. Andriyevskiy and others. 8 Nov 60, 6p. incl. illus. table, 11 refs. (Trans. no. MCL-261 from Dopovidi Akademii Nauk Ukrainskoy RSR, pp. 392-394, 1959)
Unclassified report

DESCRIPTORS: *Powder metallurgy, *Iron, USSR, *Sintering, Catalysts, Hydrogen, Moisture, Hydrochloric acid, Chlorides, Ammonium radicals, Fluorides, Oxides, Aluminum compounds, Magnetic properties, *Sintered iron, Microstructure, Surface properties, Processing, Preparation.

Toroidal compacts of reduced Fe powders were exposed for 2 hr at 1200 + or - 10 C with various atmospheres in an attempt to determine the most effective condition. The sintering conditions were (1) dry H(0.022%H20), (2) moist H(2%H20), (3) moist H(10%H20), (4) preoxidized (1%0), (5) cyclic (3 times with steam, 7 times with H), (6) in an atmosphere of H and HCl, (7) oxidized samples in H and HCl, (8) covered with Al203 + 0.1% NH4Cl, and (9) covered with Al203 + 0.1% NH4F. The specific gravities of the sintered samples were plotted versus (1) coercive force Hc, (2) maximum magnetic penetration (Mu), (3) magnetic induction in a field of 15 oer (B sub 15), and (4) residual magnetic induction Br. The presence of HCl in the sintering atmosphere had the greatest effect on Mu and Hc. Although admixture of HCl in the atmosphere favorably affect the properties of metallo-ceramic bodies, HCl had a deleterious effect on the corrosion resistance of the samples and further investigation is necessary.

AD-256 114 Div. 17, 4
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE USE OF COPRECIPITATION FOR OBTAINING ANALYTICAL CONCENTRATES OF Cd, Pd, Bi, AND Zn IN ANALYZING ALLOYS,
by A. K. Babko and P. V. Marchenko, 4 Nov 60, 14p. incl. tables (Trans. no MCL-550 from Zavodskaya Laboratoriya 23:1278-1283, 1957)
Unclassified report

DESCRIPTORS: *Heat resistant alloys, Nickel alloys, Molybdenum alloys, Tungsten alloys, Tracer studies, *Chemical analysis, Microanalysis, Spectrographic analysis, Solvent extraction, Bismuth, Cadmuim, Lead, Zinc, Separation, Chemical impurities, USSR, Metallurgical analysis.

In analyzing heat-resistant alloys of Ni with Mo or W it is necessary to determine the impurities in the form of low-melting metals that are present in quantities of 0.001 to 0.0001%. For this purpose it is first necessary to obtain analytical concentrates of the elements to be determined. Studies were made of the conditions under which micro-impurities most completely precipitate with one of the components of the alloy or with a collector, while the basic components of the alloy remain in solution. In order to monitor the completeness of the separation of Zn and Cd impurities, radioactive isotopes Zn-65 and Cd-115, were used and spectral analysis was conducted for Pb and Bi. The precipitates obtained were converted to oxides for the purpose of spectral determination. (Author)

AD-256 115 Div. 17
(18 May 61) OTS price $8.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE STRUCTURE AND PROPERTIES OF HEAT RESISTANT MATERIALS.
3 Nov 60, 98p. incl. illus. tables (Trans. no. MCL-558 from Struktura i Svoystva Zharoprochnykh Materialov, Knigi 93:10-15; 33-60; 61-69; 70-98, 1955)
Unclassified report

DESCRIPTORS: *Heat resistant alloys, USSR, Nickel alloys, Chromium alloys, Aluminum alloys, Titanium alloys, Austenite, Iron alloys, Intermetallic compounds, Hardening, Phase studies, Heat treatment, X-ray diffraction analysis, Microstructure, Lattices, Physical properties, Mechanical properties.

Contents:
Role of the alpha- phase in the relaxation resistance of Ni-Cr-Al-Ti alloys, by V. Z. Tseilin and S. A. Yuganova
The effect of composition on the structure and properties of austenetic iron-chromium-nickel alloys, by I. L. Mirkin and M. I. Fanatayeva
Effect of copper on the properties of nickel -based alloys, by R. P. Zaletayeva
Intermetallic compounds--Laves phases- in iron -chromium nickel base alloys with variable tungsten and niobium content, by S. A. Yuganova and M. D. Nesterova

AD-256 117 Div. 17, 26
(18 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
TESTING STEELS AS TO THEIR BRITTLE FRACTURE SEN-

SITIVITY BY MEANS OF THE FATIGUE BENDING TEST, by E. Rubo. 3 Nov 60, 23p. incl. illus. table, 18 refs. (Trans. no. MCL-562 from Verein Deutscher Ingenieure (VDI-Z) 98:913-919, June 56)
Unclassified report

DESCRIPTORS: *Steel, *Fracture (Mechanics), Failure (Mechanics), *Fatigue (Mechanics), Aging, Deformation, Rupture, Stresses, Load distribution, Grains (Metallurgy), Welded joints, Measurement, Hardness, Metallurgy, Test methods, Tests, *Bibliography, Brittle materials, Germany.

Various aspects of this problem are discussed and literature references are grouped under the following headings: Comparison of Various Methods of Testing the Brittle Fracture Sensitivity Fundamentals; Characteristics of the Notch Impact-Bending Test; Peculiarities of the Bending Tests on Built-Up Welded Joints; Advantages and Suitability of the Fatigue Bending Test; Fatigue Bending Tests on Thick Cross-Sections; Bending Fracture Resistance; Coarseness of Grain in the Fracture Cross-Section; Sharpness and the Development of the Crack; and Operational Aspects.

AD-256 119 Div. 17
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STRUCTURAL STEEL FRACTURES (Izlomy Konstruktsionnoy Stali),
by V. D. Sadovskiy and K. A. Malyshev. 3 Nov 60, 16p. incl. illus. 21 refs. (Trans. no. MCL-565 from Trudy Instituta Fiziki Metallov 17:111-118, 1956)
Unclassified report

DESCRIPTORS: *Steel, *Fracture (Mechanics), Metallic crystals, Crystal structure, Phase transitions, Phase studies, Hardness, Rupture, *Failure (Mechanics), Austenite, Heat treatment, Processing, Grains (Metallurgy), Metallurgical analysis, Metallurgy, Cooling, USSR.

Fracture analysis as a means of indicating structural, quality, and processing differences is discussed. Under certain conditions brittle crystalline fractures will expose the size of the austenite grain existing before the moment of cooling the steel. Martempering of structural alloy steel as a rule produces, after low-temperature tempering (200 degrees), a fibrous fracture which is replaced during tempering at 300 to 350 degrees by a brittle intercrystalline fracture. At higher temperature tempering, if a brittleness of a second kind is not produced, the fracture again becomes fibrous. Other items discussed include heat treatment and processing effects such as phase transformation, and naphthalinic-type and stone-like fractures.

AD-256 120 Div. 17, 30
(18 May 61) OTS price $4.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
METALLOGRAPHY (SELECTED ARTICLES),
by I. L. Shimelevich. 3 Nov 60, 52p. incl. illus. 18 refs. (Trans. no. MCL-566 from Metallovedeniye, Sbornik Statey, pp. 70-80; 81-99, 1957)
Unclassified report

DESCRIPTORS: *Metals, *Alloys, Deformation, Tests, *Fracture (Mechanics), Elasticity, Rupture, Measurement, Determination, USSR, *Steel, Metallurgical analysis, Stresses, Sheets, Energy.

CONCERNING STATIC BEND TESTS OF NOTCHED SPECIMENS: An energy analysis was made of the static bend diagram of notched specimens. The character of the terminal section of the static bend diagram (presence or absence of disruptions) is apparently determined by the ratio between the final work of rupture of the specimen (i.e., the work expended in spreading the crack) and the elastic energy accumulated in the specimen and the deformed components of the machine. An accurate determination of the final work of rupture of the specimens is thought to be obtainable by measuring the bend diagram planimetrically only in the absence of disruptions in the terminal section of the diagram. PROPAGATION OF CRACKS IN STEEL SHEETS UNDER INTERNAL STRESSES: Studies and calculations indicated that the elastic energy liberated as a crack grows, bears a definite functional relationship to both the internal stress and the size of the crack. The critical values for the length of the cracks were determined.

AD-256 121 Div. 17
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE MICROMECHANISM OF BRITTLE FAILURE IN STEEL (Mikromekhanizm Khrupkogo Razrusheniya Stali)
by B. S. Kasatkin. 3 Nov 60, 16p. incl. illus. 11 refs. (Trans. no. MCL-567 from Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, pp. 63-68, 1958)
Unclassified report

DESCRIPTORS: *Steel, *Alloys, *Metals, *Failure (Mechanics), *Fracture (Mechanics), Deformation, Plasticity, Impact shock, Crystals, Metallic crystals, Microstructure, Crystal structure, USSR.

Study was made of the micromechanism of brittle failure of low carbon steels. Individual stages were studied of brittle failure during impact bending of prismatic specimens, 10 x 10 x 55, with standard notches and V-notches 2.0 mm deep and having a base radius of 0.25 mm. The specimens were made of steel A (open-hearth steel MST-3 in a post-heat-treatment state (heated at 1100 degrees for 1.5 hr and cooled in the furnace)), steel B (ordinary hot-rolled Bessemer steel, brand B steel #3, 18 mm thick), and steel C (forged technical iron ingots, 16 mm thick). The process of brittle failure may be represented as follows: As a result of the load applied, some of the most favorably oriented grains break down into finer grains (blocks), and deformation occurs as a result of the movement of these finer grains within the limits of the initial grain, thus causing a change in the general form of the grain. This, in turn, causes the initial grains to shift with respect to each other along the boundary between them. A temperature reduction and an increase in the deformation rate cause the shear strength along the boundary to increase, which, in turn, increases the stress necessary for the shifting of one grain with respect to another. As a result of the difficulty of the process of plastic deformation, favorable conditions for twinning and formation of microcracks are created by the rotation of the grains. (Author)

AD-256 122 Div. 17
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONCERNING THE TENDENCY OF METALS TOWARD BRITTLE

FRACTURE (K Voprosu O Sklonnosti Metallov K Khrupkomu Razrusheniyu)
by M. M. Shteynberg, Ye. N. Sokolkov and M. N. Varaksina. 3 Nov 60, 10p. incl. illus. (Trans. no. MCL-568 from Trudy Ural'skogo Polytekhnicheskogo Instituta, Coll. 68:54-58, 1958)
Unclassified report

DESCRIPTORS: *Metals, *Fracture (Mechanics), *Alloys, Mechanical properties, Stresses, Deformation, Plasticity, *Silicon alloys, Tensile properties, *Steel, *Ferrites, USSR.

An investigation was made of the dependence of tensile strength on prior plastic deformation. The material for the investigation was taken from the following alloys: silicon ferrite with an Si content of approximately 1% and 2%; molybdenum ferrite with a content of about 1% Mo; and brand 30KhGSA steel. Plastic deformation accomplished by uniaxial static tension caused a significant increase in tensile strength. The intensity of this increase depended on the composition of the alloy and its initial structure. The accumulation of systematic data on the dependence of tensile strength on prior plastic deformation offers much interest, because such data can be used for more accurate evaluation of the tendency of alloys toward brittle fracture. (Author)

AD-256 124 Div. 17
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
RATING REAL RESISTANCE TO FAILURE (O Vychislenii Istinnogo Soprotivleniya Razrusheniyu)
by A. I. Chipizhenko. 3 Nov 60, 14p. incl. table (Trans. no. MCL-572 from Zavodskaya Laboratoriya 16:863-869, 1950)
Unclassified report

DESCRIPTORS: *Failure (Mechanics), *Rupture, Resistance, Equations, Test methods, Theory, Mathematical analysis, Deformation, Metals, Stresses, USSR, Alloys, Fracture (Mechanics).

AD-256 130 Div. 17, 25
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE NATURE OF STEEL FRACTURE (Priroda Izloma Stali),
by M. P. Braun. 4 Nov 60. 15p. incl. illus. (Trans. no. MCL-598 from Priroda Izloma Stali pp. 384-393, 1950)
Unclassified report

DESCRIPTORS: *Steel, *Fracture (Mechanics), Fractography, USSR, Crystal structure, Metallic crystals, Alloys, Grains (Metallurgy), Mechanical properties.

During the study of the structure of fracture the following basic characteristics were investigated: (1) the linear dimensions of the crystalline section and its multiplanarity; (2) the geometry of the perimeter of the section; (3) the system of bands, striations, slips, and their dimensions; (4) the cracks, fissures, or other disruptions in the continuity of the crystalline section; and (5) the condition of the surface of the section. In the case of low-carbon (0.03-0.04% C) unalloyed steel the crystalline sections are distinguished by the unusual richness of their linear systems. The most typical is the acicular packet arrangement of crystalline formations. The latter are themselves formed from a mass of tiny units. Thus, these tiny crystalline units are also not single-crystals, but are composed of a mass of crystalline splinters. The external difference between the types of fracture is due to the difference in their internal structure. The various mechanisms of formation of crystalline structure determine the differences in type of fracture. (Author)

AD-256 132 Div. 17
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE EFFECT OF ALLOYING ON THE RESISTANCE OF IRON TO BRITTLE FRACTURE (RUPTURE) (O Vliyanii Legirovaniya na Soprotivleniye Zheleza Khrupkomu Razrusheniyu (Otryvu))
by Ye. L. Bushmanova, Ya. M. Potak, and V. V. Sachkov. 4 Nov 60, 13p. incl. illus. tables. (Trans. no. MCL-601 from Zhurnal Tekhnicheskoy Fiziki 21:26-31, 1951)
Unclassified report

DESCRIPTORS: *Iron, *Iron alloys, *Alloys, *Fracture (Mechanics), *Rupture, *Steel, Ferrites, Grains (Metallurgy), Resistance, USSR.

The effect of the alloying of Fe with Cr, Si, Ni, Cu, Co, W, and Mn and the contamination of metal with P were studied. The alloying of Fe in comparing metals with a similar size of ferrite grain did not modify its resistance to brittle fracture (rupture). The effect of alloying elements on the resistance of Fe to brittle fracture was due to their effect on the size of the ferrite grains. Ni, as a rule, promoted reduction of the size of the ferrite grains, while P promoted enlargement of the ferrite grains. (Author)

AD-256 138 Div. 17, 30
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DETERMINATION OF THE SPECIFIC SURFACE OF POWDERS USED IN THE PRODUCTION OF HARD ALLOYS, (Opredeleniye Udel'noy Poverkhnosti Poroshkov Proizvodstva Tverdykh Splavov)
by B. V. Deryagin, V. N. Yermin and others. 4 Nov 60, 14p. incl. tables (Trans. no. MCL-618 from Tsvetnyye Metally 11:55-60, 1959)
Unclassified report

DESCRIPTORS: *Powders, *Powder metallurgy, Particles, Surfaces, Adsorption, Gases, Gas diffusion, Vapors, Grains (Metallurgy), Gas flow, Porosity, Air, Nitrogen, *Alloys, Tungsten alloys, Titanium alloys, Hardness, *Heat resistant alloys, Measurement, Test methods, Diffusion, Quality control, Processing, Production.

Adsorption and gas permeability methods (adsorption of nitrogen by B. V. Deryagin and Carman methods, and the adsorption of methyl alcohol) were compared for use in determining the specific surface of powders. The method using the adsorption of MeOH was not considered sufficiently accurate in the evaluation of powder dispersion. The N adsorption method, although sufficiently accurate was considered too time consuming and complicated. The Koseni-Carman method was considered valid for determining the specific surfaces of coarsely dispersed powders only. Deryagin's method (resistance to filtration of rarefied air) makes it possible to determine quickly and accu-

rately the external specific surface of highly-dispersed powders of hard alloys, and to calculate the average particle size. Particle sizes of 100 microns and less of any degree of dispersion can be determined by this method.

AD-256 139 Div. 17
(18 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
POWDER FERROMAGNETICS FOR MASS CORES,
by F. Frolich. 7 Nov 60, 31p. incl. tables. (Trans. no. MCL-620 from Metallurgie und Giessereiwesen Ser. 1, no. 61, 1953)
Unclassified report

DESCRIPTORS: Powders, *Powder metallurgy, *Ferromagnetic materials, Ferromagnetism, *Ferrite cores, *Magnetic cores, Lattices, *Magnetic materials, Grains (Metallurgy), Crystal structure, Magnetic properties, Mechanical properties, Electrical properties, Ferrites, Production, Physical properties, Processing.

Contents:
Characteristics of powder-ferromagnetics
Causes for loss constituents
Investigation of the degree of purity
Investigation of the structure
Investigation of the size and shape of the grain
Investigation of the degree of packing
Investigation of the magnetic characteristics
Determination of the permeability of mu, the hysteresis loss coefficient h, the eddy-current coefficient w and the after effect coefficient n
Determination of the magnetic instability, the temperature coefficient, as well as the timely inconstancy.

AD-256 149 Div. 17
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ALLOYS OF TRANSITION-METAL BORIDES WITH OTHER METALS,
by M. S. Kovalchenko, G. V. Samsonov, and G. A. Yasinskaya. 7 Nov 60. 10p. 12 refs. (Trans. no. MCL-671 from Izvestiya Akademii Nauk SSSR, OTN, Metallurgiya i Toplivo 2:115-119, 1960)
Unclassified report

DESCRIPTORS: *Transition elements, *Alloys, *Borides, Metallic compounds, Metals, Binders, Temperature, Stability, Mechanical properties, Zirconium compounds, Zirconium alloys, Molybdenum, Titanium alloys, Titanium compounds, Chromium compounds, Chromium alloys, USSR, Molybdenum alloys, Melting, Phase studies, Hardness.

The properties of alloys of the pseudobinary systems ZrB2-Mo, TiB2-Mo, CrB2-Mo, TiB2-Cr, and ZrB2-Cr have been studied by the visual thermal analysis method, the taking of shrinkage curves, the determination of the melting points, the measurements of the micro- and macro-hardness of the phases, and by metallographic and radiographic examinations. Hypothetical phase diagrams of the alloys ZrB2-Mo, TiB2-Mo, CrB2-Mo, TiB2-Cr, and ZrB2-Cr were constructed. (Author)

AD-256 151 Div. 17, 14
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STRENGTH OF CARBIDE-BASE ALLOYS CEMENTED WITH NiAl AND CoAl,
by Ye. I. Mozzhukhin, V. P. Yelyutin and Ya. S. Umanskiy. 7 Nov 60. 10p. (Trans. no. MCL-674 from Izvestiya Vysshikh Uchebnykh Zvedeniy 3: 131-135, 1960)
Unclassified report

DESCRIPTORS: *Alloys, *Carbides, Nickel alloys, Aluminum alloys, Cobalt alloys, Adhesives, *Binders, Bonding, Mechanical properties, Temperature, Effectiveness, Titanium compounds, Tungsten compounds, Tungsten alloys, Titanium alloys, USSR.

Attempts were made to determine the effect of the amount of the NiAl binder and its composition on carbide-base alloy properties. Alloys on a TiC base, cemented by a NiAl binder, had a higher bending strength at 1000 degrees than at room temperature. Alloys based on titanium-tungsten carbide and containing about 16% TiC preserved their strength up to a temperature of between 900 and 1000 degrees when cemented with the NiAl binder. Alloys on a Ti-WC base, when cemented by the CoAl binder were stronger than similar alloys cemented by a NiAl binder. The strength of alloys on a TiC base at room temperature did not depend on the composition of the NiAl binder. At 1000 degrees the composition of the NiAl binder affected the strength of alloys. The composition of the carbide base had a significant effect on the strength of alloys which are cemented by NiAl and CoAl binders. Alloys on a pure TiC base and on a Ti-W base with a large TiC (64% TiC) had great strength at room temperature. However, these alloys maintained and even increased their strength at temperatures of 1000 to 1100 degrees. (Author)

AD-256 152 Div. 17, 26
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE SINTERING OF IRON WITH CYCLIC CHANGE OF TEMPERATURE IN A CRITICAL RANGE,
by R. A. Andriyevskiy and I. M. Fedorchenko. 7 Nov 60, 5p. incl. tables (Trans. no. MCL-675 from Inzhenerno-fizicheskiy Zhurnal 3:71-73, Feb 60)
Unclassified report

DESCRIPTORS: *Iron, Sintering, Magnetic properties, Density, Temperature, Powder metallurgy, Processing, *Sintered iron.

Study was made of the effect of cyclic changes in sintering temperature between the critical points A sub 2 and A sub 3 on the magnetic properites of sintered Fe. Tests were conducted on specimens (D = 12 mm, d = 8 mm, and h = 8 mm), which were pressed from reduced iron powder. The specimens were sintered in a H atmosphere in a tubular electric furnace with low thermal inertia, thereby making it possible to perform cyclic sintering for an entire six-minute reversible cycle. It is shown that cyclical sintering is not accompanied by a more rapid rate of change of magnetic properties and density. (Author)

AD-256 154 Div. 17, 26, 30
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
EFFECT OF REMELTING IN AN ARC VACUUM FURNACE ON

THE PROPERTIES OF A NICKEL-BASE HEAT-RESISTANT ALLOY,
by V. A. Sheremet'yev. 26 July 59, 10p. incl. tables (Trans. no. MCL-678 from Izvestiya Vysshikh Uchebnykh Zavedeniy, Chernaya Metallurgiya 10:43-48, 1959)

Unclassified report

DESCRIPTORS: *Heat resistant alloys, Melting, *Nickel alloys, Vacuum furnaces, Mechanical properties, Physical properites, Alloys, Crystal structure, Chemical properties, Hardness, Tensile properties, Plasticity, USSR.

A study was made of the effect of remelting in an arc vacuum furnace on the properties of a heat-resistant nickel-base alloy. The alloy possesses high heat resistance but not sufficient plasticity. Conclusions: (1) It is possible to obtain ingots without surface defects in an arc vacuum furnace (the volume of the shrinkage cavity is considerably reduced in ingots produced in an arc vacuum furnace; there are no sub-skin porosities, scabs, or laps); (2) remelting in an arc furnace ensures a decrease in the C, S, O, and N content in the alloy; (3) the nonmetallic inclusions are markedly reduced in an alloy melted in an arc vacuum furnace (the inclusion particles are finer and are uniformly distributed through the volume of the metal); and (4) remelting in a vacuum ensures increased tensile strength of an alloy and improvement of its plasticity. (Author)

AD-256 155 Div. 17
(18 May 61) OTS price $14.00.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HANDBOOK ON MACHINE-BUILDING MATERIALS, VOLUME II. FERROUS METALS AND THEIR ALLOYS (SELECTED ARTICLES FROM) (Spravochnik Pr Mashinostroitel'nym Materialam Tsvetnyye Metally I Ikh Splavy)
13 Sep 60, 1v. incl. tables. (Trans. no. MCL-681 from Mashgiz, Gosudarstvennoye Nauchno-Tekhnicheskoye Izdatel'stvo Mashinostroitel'noy Literatury, Moscow, pp. 446-490, 501-527, 571-614, 1959)

Unclassified report

DESCRIPTORS: *Metals, *Alloys, *Machines, Materials, Handbooks, *Iron alloys, Tantalum, Niobium, Physical properties, Chemical properties, Mechanical properties, Metallurgy, Sintered alloys, Powder alloys, Powder metallurgy, *Powder metals,

Contents:
Rare metals and their alloys, by A. N. Zelikman and I. P. Kislyakov
Tantalum and Niobium, by A. N. Zelikman and I. P. Kislyakov
Powder metal materials, by M. Yu. Bal'shin.

AD-256 156 Div. 17
(18 May 61) OTS price $5.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PROBLEM OF ALLOYING ALPHA-IRON-BASE HEAT RESISTANT STEEL (K Voprosu O Legirovanii Teploustoychivoy Stali Na Osnove Alpha-Zeleza)
by N. T. Gudtsov, O. A. Bannykh and I. F. Zudin. 26 Aug 60, 55p. incl. tables, 26 refs. (Trans. no. MCL-682 from Academy of Sciences USSR, Institute of Metallurgy pp. 1-69, 1959)

Unclassified report

DESCRIPTORS: *Iron alloys, *Steel, *Alloys, *Heat resistant alloys, USSR, Stability, Chemical properties, Microstructure, Silicon, Tungsten, Molybdenum, Chromium, Carbides, Temperature, Dispersion hardening, Solids, Solutions, Phase studies,

A study was made of alloying alpha-Fe lattice base-steel to increase its heat resistance. The influence of the chemical composition, changes in the microstructure of the metal with changes in composition, and concentration of alloying additions were considered. Some of the methods of increasing heat resistance studied were (1) separation of excess phases from the saturated solid solution; and (2) introducing elements into the Fe lattice of atoms. Some of the elements tested were W, Mo, Si, and Cr. Stabilization of the carbide phase, i.e., binding the C with the element or elements by a strong carbide forming element, made it possible to transform a predominant number of atoms of element into solid solution which reinforced steel through the solid solution and thereby enable proper use of Mo or W for the strengthening of steel.

AD-256 167 Div. 17, 26
(18 May 61) OTS price $4.60

Titanium Metals Corp. of America, Toronto, Ohio.
TITANIUM SHEET ROLLING PROGRAM FOR Ti-8Al-1Mo-1V, Ti-5Al-5Sn-5Zr, AND Ti-7Al-12Zr,
by D. L. Day, D. R. Mitchell, and H. D. Kessler. Bimonthly rept. no. 6, 1 May-30 June 60. 30 Mar 61. 39p. incl. illus.
(Contract NOa(s) 59-6227-c)

Unclassified report

DESCRIPTORS: *Titanium alloys, Aluminum alloys, Molybdenum alloys, Vanadium alloys, Tin alloys, Zirconium alloys, *Sheets, Creep, Heat treatment, Temperature, Welds, Welded joints, Welding, Fracture (Mechanics), Tensile properties, Mechanical properties, Fatigue (Mechanics), Cooling, Grains (Metallurgy), Processing.

Additional creep-stability tests and thorough chemical analyses were performed on Ti-8Al-1Mo-1V sheet mill annealed at 1350F (8 hr), rather conclusively showing that the substandard creep resistance at 1000F is associated with this lower annealing temperature. Evaluation of welded Ti-8Al-1Mo-1V was completed, which demonstrated that this alloy has good welded strengths and ductility, excellent creep properties, and good notch tensile characteristics at sub-zero temteratures. Additional crack propagation studies indicated that, at a lower annealed strength level (140 Ksi YS), the crack propagation resistance of Ti-8Al-1Mo-1V is markedly improved. The remainder of the five 1600-pound ingots of Ti-8Al-1Mo-1V were melted and a processing schedule was formulated. Slab samples from the first two heats of Ti-5Al-5Sn-5Zr and Ti-7Al-12Zr were examined macrographically and thoroughly analyzed chemically. (Author)

AD-256 190 Div. 17
(18 May 61) OTS price $18.00

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
EFFECT OF FRACTURES ON MECHANICAL PROPERTIES OF STRUCTURAL STEEL,
by B. A. Drozdovskiy and Ya. B. Fridman. 1 Nov 60, 285p. incl. tables. (Trans. no. MCL-721 from Vliyaniye Treshchin Na Mekhanicheskiye Svoystva Konstruktsionnykh Staley pp. 12-260, 1960)

Unclassified report

DESCRIPTORS: *Steel, *Failure (Mechanics), *Fracture (Mechanics), Metallurgy, Rupture, Hardness, Fatigue (Mechanics), Cooling, Heat treatment, Processing, Theory, USSR, Test methods, Mechanical properties, Metals, Brittle materials, Deformation, Tests.

Contents:
Theories on break-up due to brittleness
Fundamental methods of evaluating the tendency of metals toward brittle destruction
Estimation of crack sensitivity by the value of the energy to fracture under static bending
The effect of an existing crack on the resistance to rupture and strength during static bending
Effect of fiber orientation and heat treatment on bending-tested properties of specimens with previously obtained crack

AD-256 204 Div. 17
(18 May 61) OTS price $4.60

Universal-Cyclops Steel Corp., Bridgeville, Pa.
MOLYBDENUM SHEET ROLLING PROGRAM,
by W. A. McNeish. Interim technical rept. no. 10, 26 Nov 60-25 Jan 61. 20 Mar 61, 38p. incl. illus. tables.
(Contract NOa(s) 59-6142-c)
Unclassified report

DESCRIPTORS: *Molybdenum, *Molybdenum alloys, Titanium alloys, Sheets, Manufacturing methods, Processing, Extrusion, Forging, Rolling mills, Fracture (Mechanics), Plasticity, Mechanical properties, Chemical analysis, Tests.

Three Mo + 0.5% Ti ingots were processed to sheet bar by extrusion, forging, and rolling with good yields. Plasticities of Mo + 0.5% Ti and TZM ingot structures were determined from 2400 to 4000 F. Minimum plasticity was found in the range of 3000 to 3400 F. An outline of phase II (sheet rolling development) is presented. This phase will consider the effect of the following process variables on 0.060 in. Mo alloy sheet: (1) surface contamination, (2) transition temperature and room temperature tensile properties, (3) elevated temperature tests, (4) chemical homogeneity and impurity level, (5) laminations, (6) surface imperfections, (7) dimensional tolerance, and (8) inert atmosphere fabrication.

AD-256 206 Div. 17
(17 May 61) OTS price $1.10

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE METALLURGY OF BERYLLIUM,
by Webster Hodge. Memo. rept. for 1 Feb-30 Apr 61. 10 May 61, 4p. incl. table, 12 refs. (DMIC memo. no. 105)
Unclassified report

DESCRIPTORS: *Beryllium, Metallurgy, Preparation, Processing, Production, Purification, Mechanical properties, Physical properties, Impurities.

AD-256 210 Div. 17, 26, 31
(18 May 61) OTS price $1.60

Republic Steel Corp., Canton, Ohio.
DEVELOPMENT OF FUSION WELDING TECHNIQUES FOR TWO INCH THICK TITANIUM PLATES (GRADE RS70, COMMERCIALLY PURE)
by J. Savas. Bi-monthly rept. no. 4, 1 Nov-31 Dec 60. Jan 61, 5p. illus. tables.
(Contract NOa(s) 60-6091-f)
Unclassified report

DESCRIPTORS: *Titanium alloys, *Metal plates, *Welding, Welding rods, *Titanium, Welded joints, Welds, Titanium wire, *Arc welding, Processing, Heat treatment, Hydrogen, Submarine hulls, Ship hulls, Ship plates.

Welding techniques for 2 in.-thick, commercially pure (RS70) Ti plate were investigated. One of the 2 sets of these plates, machined to a modified double-V joint design, was welded using the W arc, inert gas shielding method. Some preliminary welding was done on 2 short lengths of 2-in. thick RS70 plate material to check the cooling and shielding characteristics of the welding set up. Two primary factors in the production of good welds in Ti appear to be: (1) rapid cooling of the weld metal to low temperatures; and (2) effective shielding of the weld area during the cooling cycle. Additional efforts included base and weld metal hardness checks on a cross section of the initial weld; and chemical and vacuum fusion analysis of the 0.063 in.-diam, RS55 welding wire. A 1300 F vacuum annealing cycle on one coil reduced the H level to 25 ppm.

AD-256 309 Div. 17
(19 May 61) OTS price $3.60

Virginia Inst. for Scientific Research, Richmond.
THE ACCELERATED CORROSION OF METALS,
by Henry Leidheiser, Jr., and David A. Jackson, Jr. Quarterly rept. no. 6, 16 Dec 60-15 Mar 61. 21 Apr 61. 30p. incl. illus. tables.
(Contract DA 18-108-405-cml-518)
Unclassified report

DESCRIPTORS: *Metals, *Corrosion, *Aluminum, *Oxidation, Mercury compounds, Halides, *Copper, Chlorides, Acids, Iodides, Corrosion inhibition, Nitric acid, Hydrochloric acid, Sulfuric acid, Corrosion research, Transition elements, Palladium.

OXIDATION OF AL IN CONTACT WITH MERCURIC HALIDES: The rate curves obtained during the oxidation of Al in contact with mercuric iodide were linear during a significant time interval. These linear portions were sometimes preceded by an induction period of low rate. An average of the slopes of the linear portions of all the oxidation rate curves gave a value of 0.136 mg O2/sq-cm/min.
THE CORROSION OF COPPER IN MINERAL ACIDS IN THE PRESENCE OF GROUP VIII CHLORIDES: A brief survey was made of the effect of group VIII chlorides on the corrosion of Cu in HCl, H2SO4, and HNO3. No instances of accelerated corrosion were observed in these systems. Palladium was an excellent inhibitor for the corrosion of Cu in 2M HNO3.

AD-256 496 Div. 17, 27
(23 May 61) OTS price $2.60

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
STRESS CORROSION OF HIGH STRENGTH STEELS AND ALLOYS; ARTIFICIAL ENVIRONMENT,
by H. L. Anthony, C. J. Owen and others. Monthly scientific progress rept. no. 10 for Apr 61. Apr 61, 25p. incl. illus. tables.
(Contract DA 36-034-ORD-3277, Proj. 389-1)
Unclassified report

DESCRIPTORS: *Steel, Titanium alloys, Tests, Cobalt alloys, Corrosion, Rocket cases, *Corrosion research, Mechanical properties, Stresses, Corrosive liquids, Corrosive gases, Salts, Sodium compounds, Heat treatment, Alloys, *Heat resistant alloys.

Cumulative U-bend and bent beam stress corrosion test results on selected high strength missile steels and alloys are presented. The materials under test include AM355, PH15-7Mo, B120VCA, Vascojet 1000, 300M, D6Ac, 4137 Co, Rocoloy 270, and Ardeform 301. A heat treating survey of the Vascojet primary heat is presented. The information will be used in heat treating sample material to the various stress levels for stress corrosion testing. (Author)

AD-256 506 Div. 17, 12
(23 May 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
TENSILE PROPERTIES OF 17-7 PH AND 12 MoV STAINLESS-STEEL SHEET UNDER RAPID-HEATING AND CONSTANT-TEMPERATURE CONDITIONS,
by Charles R. Manning, Jr., and Howard L. Price. May 61, 28p. incl. illus. tables (NASA Technical note D-823)
Unclassified report

Also available from NASA, Washington 25, D. C., as NASA Technical note D-823.

DESCRIPTORS: *Stainless steel, *Steel, Molybdenum alloys, Vanadium alloys, Heat, Sheets, Thermal stresses, Mechanical properties, Tensile properties, Test methods, Temperature, Failure (Mechanics), Rupture, *Aerodynamic heating, Stresses, Measurement, Re-entry vehicles, Guided missiles.

Results are presented of rapid- heating tests of 17-7 PH and 12 MoV stainless-steel sheet heated to failure at temperature rates from about 1 F to 170 F per second under constant-load conditions. Yield and rupture strengths obtained from rapid-heating tests are compared with yield and tensile strengths obtained from short-time elevated-temperature tensile tests (30-minute exposure). A rate-temperature parameter was used to construct master curves from which yield and rupture stresses or temperatures can be predicted. A method for measuring strain by optical means is described. (Author)

AD-256 608 Div. 17
(26 May 61) OTS price $6.60

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT AND APPLICATION OF A THEORY OF PLASTIC DEFORMATION OF CEMENTED ALLOYS,
by N. M. Parikh. Interim technical rept. 23 Mar 61, 60p. incl. illus. tables (Rept. no. ARF 2182-12)
(Contract DA 11-022-505-ORD-3092, Proj. TB4-002)
(WAL TR 372/32) Unclassified report

DESCRIPTORS: *Alloys, *Deformation, *Iron alloys, *Plasticity, *Tungsten alloys, *Powder alloys, *Nickel alloys, Stresses, Bonding, Mechanical properties, Sintered alloys, Determination, Grains (Metallurgy), Microstructure.

An investigation was undertaken to study the fundamental reasons for room temperature ductility, and strength of the W-Ni-Fe alloys. In the cemented W-Ni-Fe alloys, the chemistry of the matrix alloy was established by the use of the electron probe analyser. The sources of strength and ductility of cemented structures in the W-Ni-Fe system were established by careful determination of yield strength - grain size relationship in the matrix alloy as well as tungsten and extrapolating the plots to the grain sizes of the components in the cemented structures. The work hardening characteristics of the components were also taken into account. The residual stresses in the cemented W-Ni-Fe alloys were calculated from precise measurements of the lattice parameters of matrix and W as a function of gross composition. A cursory application of the principles derived to the development of new alloys based on W and on Fe showed the soundness of these principles and resulted in a few new Fe-Cu base alloys. (Author)

AD-256 610 Div. 17, 26
(26 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONCERNING THE EFFECT OF COMPRESSIVE STRESSES ON SHRINKAGE IN SINTERING OF POROUS BODIES,
by I. M. Fedorchenko and R. O. Andrievskiy. 18 Nov 60, 7p. (Trans. no. MCL-283 from Dopovidi Akademii Nauk Ukrainsk'oi RSR, pp. 281-285, 1959)
Unclassified report

DESCRIPTORS: Stresses, *Powder metals, Silver, Copper, Nickel, *Sintering, Volume, *Powder metallurgy, Pressure, Deformation, Diffusion, Porosity, USSR.

Results are presented of a study of the effect of uneven compressive stresses on volume shrinkage of sintered bodies consisting of silver, copper and nickel powders (at 600 to 800 C and for 5 min.). The dependence of the shrinkage on the stress, allowing for the geometrical factor, proved to be nonlinear in the case of annealed powders, which is due to plastic deformation arising on application of the load to the sintered body. The inference may be drawn that, under conditions of free sintering, the processes occurring are diffusion processes and not plastic strain. (Author)

AD-256 633 Div. 17, 26
(26 May 61) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE TECHNOLOGY OF TUNGSTEN,
by V. D. Barth. Rept. for Jan-Apr 61. 18 May 61, 4p. incl. table (DMIC Memo. no. 108)
Unclassified report

DESCRIPTORS: *Tungsten, *Tungsten alloys, Casting, Forging, Tensile properties, *Refractory materials, Refractory coatings, Rocket motor nozzles, *Heat resistant alloys, Molybdenum alloys, Mechanical properties, Welding, Processing, Powder metallurgy, Explosive forming, Electron beams, Powder metals, Plasma jets.

AD-256 658 Div. 17, 26, 27
(26 May 61) OTS price $1.60

National Research Corp., Cambridge, Mass.
DEVELOPMENT OF TANTALUM-TUNGSTEN ALLOYS FOR HIGH

PERFORMANCE PROPULSION SYSTEM COMPONENTS,
by M. L. Torti. Ta-W quarterly rept. no. 7, 10 Oct 60-9 Jan 61. 9 Jan 61, 21p. incl. illus. (Contract NOrd-18787)

Unclassified report

DESCRIPTORS: *Tantalum alloys, *Tungsten alloys, *Rocket motor nozzles, Tantalum compounds, Carbides, Refractory materials, Heat resistant alloys, Erosion, Forging, Extrusion, Manufacturing methods, Casting, Microstructure, Hafnium alloys, Heat treatment, Exhaust gases, Metallurgy, Mechanical properties, Coatings.

Efforts were directed toward evaluating the effects of the A-3 propellant upon the higher W content alloys and carburized pure Ta. The effects of carb[illegible] thickness and tantalum substrate thickness were evaluated using A-3 Herm testing conditions. The addition of W strongly increased the resistance to rocket nozzle exhaust gases. No erosion occurred in Ta-10 and -20% W inserts in the standard Atlantic Research Corporation Arcite 373 firings. Jetavator bar firings at ARC exhibited increasing resistance as the W content was increased to 30%. Forged full-scale inserts of Ta-10% W were adequate for Polaris A-2 second stage conditions but failed at higher mass rates of flow. An insert of pure Ta carburized to a depth of 0.030 in. showed no erosion in a standard Arcite 373 test firing. Alloys containing up to 30% W were cast and machined. The fabrication procedures for sheet, rod, wire and shape forgings was established for Ta-10% W. Ta-20% W ingots were extruded and upset forged. Physical, mechanical and metallurgical properties were determined for the Ta-10% W alloy at room and elevated temperatures. (Author)

AD-256 767 Div. 17
(31 May 61) OTS price $2.60

Naval Research Lab., Washington, D. C.
THE EFFECT OF COLD WORK AND TEMPERATURE ON THE STRENGTH AND STRUCTURE OF STEEL,
by P. Shahinian and M. R. Achter. 24 Apr 61, 19p. incl. illus. tables, 15 refs. (NRL rept. no. 5603)

Unclassified report

DESCRIPTORS: *Steel, *Microstructure, *Hardness, X-ray diffraction analysis, *Tensile properties, Heat treatment, Hardening, Processing, Grains (Metallurgy), Deformation, Creep, Rupture, Microscopy, Electron microscopy, Metallurgical analysis, Temperature, Mechanical properties, Lattices, Crystallization.

The influence of cold work on the strength of a low-alloy steel, AISI 4140, at elevated temperature was investigated. Measurements, which include hardness, tensile, and creep-rupture properties, were used to explain the behavior of the material, including an apparent anomaly. In addition, optical and electron microscopy, and X-ray diffraction techniques were employed to follow microstructural changes in the steel. The steel in the quenched and tempered condition was strengthened, in a normal manner, in creep-rupture at high temperatures by large amounts of cold work, but was weakened in an anomalous manner by small amounts of deformation. This reduction in strength of the cold-worked steel, compared to an unworked sample, is attributed to an observed increase in mean-free ferrite path, induced apparently by the prior cold work. The weakening at small deformations and strengthening at large deformations is explained in terms of two opposing effects of cold work in competition: a softening due to a microstructural change and a hardening as a result of lattice strain and strain aging. For small amounts of cold reduction the softening predominates, whereas for large amounts the hardening is the more effective. In contrast to the behavior of the quenched and tempered steel, the steel in the annealed condition was strengthened progressively by an increase in prior cold work. (Author)

AD-256 786 Div. 17
(29 May 61) OTS price $2.60

Denver Research Inst., Colo.
A FUNDAMENTAL INVESTIGATION OF THE ALLOYING BEHAVIOR OF THE RARE EARTHS AND RELATED METALS,
by Albert S. Yamamoto, Charles E. Lundin, and Joseph F. Nachman. Semi-annual progress rept. no. 3, 1 Nov 60-30 Apr 61. May 61, 23p. incl. illus. tables.
(Contract AF 33(616)6787, Proj. 7021)

Unclassified report

DESCRIPTORS: *Rare earth elements, *Alloys, Praseodymium, Neodymium, *Phase studies, Vapor pressure, Vapors, Vacuum apparatus, Calibration, Silver, X-ray spectroscopy, Fluorescence, *Phase transitions, *Transition temperatures, Melting, Gas diffusion, Standardization, Measurement, Temperature, Thermocouples.

A number of minor modifications were incorporated into the Knudsen effusion apparatus, resulting in significant improvements in accuracy of the data obtainable. Vapor-pressure determinations of high-purity liquid Ag have been completed and agree excellently with published data. A series of Pr-Nd alloys in increments of 10 At.-% have been arc melted, and x-ray fluorescence analytical procedures were developed using these alloys as standards. Because of the low vapor pressure of Pr, necessitating higher operating temperatures, the use of W/Re thermocouples is now being considered. The Knudsen effusion apparatus has been found to serve as an excellent thermal-analysis unit. Good agreement was obtained between experimentally determined transition and melting temperatures of Pr and those in the literature. (Author)

AD-256 798 Div. 17, 26
(29 May 61) OTS price $1.10

Oregon Metallurgical Corp., Albany.
DEVELOP PROCESS FOR AND ARC CAST 25 TO 50 POUND INGOTS OF TIN REDUCED MOLYBDENUM,
by Allen D. Abraham. Progress rept. 28 Feb-31 Mar 61. 31 Mar 61, 3p.
(Contract NOrd-18124)

Unclassified report

DESCRIPTORS: *Molybdenum, Reduction, Casting, Melting, Processing, *Molybdenum castings, Castings, Tin, Sulfur, Sulfides, Electric arcs, Powder metals.

One 100-lb ingot was melted. Product purity was quite good with the exception of S. The ingot has been broken down and recompacted with Sn powder for remelting. The distribution of Sn throughout briquettes has been a problem area. Further work needs to be done in this area for residual S has continually been noted in the end product. The Mo reduction facility was shut down, cleaned, and repaired. A total of 1484 lbs of SnS was recovered from the system during cleaning of the condenser and filter. About 25% of the SnS was found in the filter. (Author)

AD-256 799 Div. 17, 26
(29 May 61) OTS price $1.60

Oregon Metallurgical Corp., Albany.
DEVELOP PROCESS FOR AND ARC CAST 25 TO 50 POUND INGOTS OF TIN REDUCED MOLYBDENUM,
by Allen D. Abraham. Progress rept. for 31 Mar-30 Apr 61. 30 Apr 61, 14p. incl. illus. tables.
(Contract NOrd-18124)
Unclassified report

DESCRIPTORS: *Molybdenum, *Molybdenum castings, Castings, Casting, Melting, Processing, Forging, Rolling mills, Sheets, Fracture (Mechanics), Mechanical properties, Powder metals, Electric arcs, Tin, Reduction, Grains (Metallurgy).

One 100 lb Mo ingot was melted and preliminary testing done. The metal exhibited room temperature ductility, had extremely good grain boundary strength, and small specimens could be forged and rolled to sheet directly from the as-cast material. The forgings exhibited good metal flow and excellent quality. The most striking feature of the metal was the excellent grain boundary strength. Two pieces of material, 4 x 4 x 1 in., were cut from the 100 lb as-cast ingot for conversion into sheet by direct rolling. (Author)

AD-256 864 Div. 17, 25
(1 June 61) OTS price $1.60

Stanford U., Calif.
ELASTIC PROPERTIES RESEARCH,
by J. L. Lytton, J. A. Hren and others. Progress rept. no. 3, 1 Oct 60-31 Mar 61. 7p. incl. illus.
(Contract AF 33(616)6789)
Unclassified report

DESCRIPTORS: *Elasticity, *Metals, *Alloys, Aluminum alloys, Cobalt alloys, Iron alloys, Ferromagnetic materials, Brass, Creep, Temperature, Plasticity, Deformation, Grains (Metallurgy), Crystal structure, Relaxation time, Test equipment, Mechanical properties, Ferromagnetism.

Contents:
Equipment for dynamic measurement of Young's Modulus at high temperatures, by J. Lytton, J. Hren, and others
Effect of disordering on Young's Modulus of ordered alloys, by J. Hren
Role of grain boundary relaxation on the elastic properties of polycrystalline aggregates, by A. J. Ardell and G. A. Coquin
The effect of ferromagnetism upon elastic and plastic properties of metals, by K. Kamber
Effect of preferred orientation on elastic modulus of polycrystalline aggregates at elevated temperature, by J. Lytton

AD-256 879 Div. 17
(31 May 61) OTS price $1.60

Alloyd Research Corp., Watertown, Mass.
RESEARCH ON THE PRODUCTION OF ULTRA-PURE MOLYBDENUM.
Progress rept. no. 3, 2 Mar-2 May 61. 2 May 61, 13p. incl. illus. tables.
(Contract NOw 61-0242-6)
Unclassified report

DESCRIPTORS: *Molybdenum compounds, Zone melting, *Molybdenum, Chlorides, Production, Purification, Sublimation, Reduction, Preparation.

An improved system was placed in operation for the distillation of molybdenum pentachloride, MoCl5. The sublimation system could handle up to 3 lb of MoCl5 a day; The system operates with Cl as the carrier gas, the sublimation temperature being 170 to 200 C, the condenser being at room temperature, and the tube connecting the sublimation chamber to the condenser being about 220 C. The horizontal zone-refining of MoCl5 does not appear to hold much promise; vertical zone refining appears to be the more favorable one. The production scheme for the high-purity MoCl5 includes distillation, sublimation, zone refining, and reduction.

18. MILITARY SCIENCES AND OPERATIONS

AD-256 257 Div. 18, 24
(19 May 61) OTS price $7.60

Aero Service Corp., Philadelphia, Pa.
THE COMPILATION OF A MANUAL FOR SCREENING SMALL SCALE AERIAL PHOTOGRAPHY,
May 61, 66p. incl. illus. (Rept. no. 8202-30B)
(Contract AF 30(602)1879)
(RADC TR 60-101) Unclassified report

DESCRIPTORS: *Instruction manuals, Military intelligence, *Aerial photography, *Photographic analysis, Aerial photographs, Air intelligence, *Photographic intelligence, Target recognition, Identification, Tests, Handbooks, Training devices.

An investigation is reported which led to the production of a special type of photo interpretation manual - a manual on the interpretation of photography at extremely small scales. The aim of the investigation was to develop and present clues by which interpreters could extract intelligence concerning significant military targets from small scale, low resolution aerial photography. A system was developed for identifying targets by category, and methods are shown for extracting the maximum intelligence which the photography provides. Data is also developed indicating the effects on interpretability of increasing ground resolution. The manual, based on the results of the investigation, was designed as a training aid to assist interpreters in effective utilization of low resolution photography. (Author)

AD-256 332 Div. 18, 30
(22 May 61) OTS price $3.60

Columbia U., New York
SOME POSSIBLE APPLICATIONS OF PROJECT OUTCOMES RESEARCH METHODOLOGY,
by Albert S. Frances. Rept. on Research on Comparative Impact of Actual Versus Anticipated Events. 31 Mar 61, 25p. 11 refs.
(Contract AF 49(638)743)
(AFOSR-444) Unclassified report

DESCRIPTORS: *Operations research, *Probability, *Mathematical prediction, Theory, Reasoning, Research program administration, Sociology, Psychological warfare, Test methods, *Military intelligence, Military operations, Personnel, Selection.

Section I, refers to the possibility of using the theory and methodology of Project Outcomes to problems of strategic information. It is felt that once the methods of this Project have been

satisfactorily developed, they might be standardized and operationalized for the use of the agencies concerned with gathering strategic information. Section II covers possible applications of this Project to problems of intelligence, evaluation and control of specific foreign operations as related to logistic and tactical problems. Section III discusses possible development of our methodology for the purposes of assessing present and future organizational effectiveness. Section IV, refers to the applications that our study may have for problems of personnel selection, training and evaluation. Specifically, it is possible that the inclusion of ex-ante data in the standard procedures currently in use for personnel selection, training and evaluation, might lead to substantive improvements in predictive power and reliability. (Author)

AD-256 530 Div. 18
(24 May 61) OTS price $3.60

George Washington U., Washington, D. C.
EXPERIENCE IN DATA COLLECTION. SUMMARY,
by J. E. Hamilton. 15 May 61, 35p. incl. table.
(Serial no. T-127/60)
(Contract Nonr-76105, Proj. NR 047 001)
Unclassified report

DESCRIPTORS: *Naval logistics, Naval supplies, *Naval vessels, Classification, Analysis, Data, Collecting methods, Coding, Records.

AD-256 560 Div. 18, 1, 33
(24 May 61) OTS price $3.60

Industrial Coll. of the Armed Forces, Washington, D. C.
THE AIRSHIP AS A MULTIPURPOSE PLATFORM INCLUDING IMPACT ON MILITARY LOGISTICS,
by Ronald W. Hoel. 1 Mar 61. 35p. incl. illus. 28 refs. (Pub. no. M61-22)
Unclassified report

DESCRIPTORS: *Airships, *Logistics, Military requirements, Air force operations, Costs, Production, Design, Air force logistics, Military operations, *Military transportation, Air transportation.

Contents:
The structural airship (description and characteristics)
The multipurpose capability of structural airships
The airship in support of limited war
Hypothetical movement problem

19. NAVIGATION

AD-256 866 Div. 19, 8
(2 June 61) OTS price $5.60

Craig Systems, Inc., Danvers, Mass.
AIR TRAFFIC CONTROL SET AN/TSW-1(XC-1) AND AIR TRAFFIC CONTROL SET AN/TSW-1(XC-2),
by Charles J. Carson. Final rept. June 57 to 11 Jan 61. 11 Jan 61, 38p. 1v. incl. illus. tables.
(Contract DA 36-039-sc-66410)
Unclassified report

DESCRIPTORS: *Air traffic control systems, Communication systems, Mobile, Navigation, *Radio communication systems, High frequency, Very high frequency, Ultra high frequency, Shelters, *Ground controlled approach radar, Radar equipment, Military communications, Installation, Tests, Power supplies, Design.

The AN/TSW-1 (XC-1) is an air traffic control tower for the control of air traffic on and around air fields and during landings and take-offs. It houses both visual and audio communications equipment. Its basic use is similar to that of a permanent airport control tower. The AN/TSW-1 (XC-2) is an air traffic control set consisting of a visual control shelter and a radar control shelter for all weather control of aircraft on and around an air field. Both facilities can be operated independent of or in conjunction with other airport facilities. Both facilities are self-contained except for primary power. Primary power can be obtained from a commercial source or from mobile generator units. The development and construction of these facilities is described. The arrangement, mounting and installation of communications and navigational equipment in the shelters is also described. The control sets are complete installations, capable of being transported by truck, cargo aircraft, helicopter, or ship. (Author)

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-256 004 Div. 20, 25
(16 May 61) OTS price $1.10

California U., Berkeley.
THE OPTICAL AND PARAMAGNETIC RESONANCE SPECTRA OF TRIVALENT Pu239 IN THE TRICHLORIDE AND ETHYLSULFATE,
by H. Lammermann and H. J. Stapleton. Apr 61, 6p. incl. table (Technical rept. no. 7)
(Contract Nonr-22261, Proj. NR 017-723; In cooperation with Radiation Lab., U. of Calif., Berkeley)
Unclassified report

DESCRIPTORS: *Plutonium, Radioactive isotopes, Spectrographic analysis, Fluorescence, *Paramagnetic resonance, Crystals, Single crystals, Energy, Atomic energy levels, Excitation, Electrons, Ions, Nuclear spins, Lanthanum compounds, Samarium, Chlorides, Ethyl radicals, Sulfates, Optical analysis, *Atomic spectrum, Quantum mechanics, Optics, Perturbation theory.

The optical and fluorescent spectra of trivalent Pu-239 in LaCl3 and La(C2H5SO4)3 . 9H2O were investigated together with the paramagnetic resonance absorption of Pu-239 in LaCl3 at 3 cm wavelengths and 4.2K. The optical spectra were taken at 77, 20 and 4.2K on a grating spectrograph. The over-all splitting of the levels as well as the line widths are about the same as those observed in the corresponding salts of Sm(3+) (4f(5)). The magnetic quantum numbers of the 3 crystal field components, the observed energies, and the experimentally determined crystal field matrix elements for the 2 salts are presented. The matrix elements of the concentrated Sm salts are also presented for comparison. Two Pu(3+) doped LaCl3 samples were further investigated by the paramagnetic resonance absorption technique.

AD-256 007 Div. 20
(17 May 61) OTS price $4.60

Florida State U., Tallahassee.
EXPERIMENTAL EVIDENCE FOR CLUSTER STRUCTURES IN LIGHT AND MEDIUM WEIGHT NUCLEI,
by Raymond K. Sheline. Interim technical rept. no. 1. 1 May 61, 34p. illus. 14 refs.
(Proj. 2945-P; Grant no. DA-ORD-31-124-61-G50)
(OOR rept. no. 2945:1) Unclassified report

DESCRIPTORS: *Nuclei, *Nucleons, *Nuclear structure, Theory, *Nuclear models, Nuclear states, Nuclear energy levels, Alpha particles, Alpha particle spectroscopy, Nuclear spins, *Nuclear shell models.

The assumption made in accordance with the cluster model is that nuclei may be considered to be composed of clusters (single nucleons, H-2, He-3, H-3, He-4, etc.). Comparison of cluster model predictions and experimental level schemes are made for the nuclei Li-7, Be-7, C-12, O-16, F-19, Ne-20, Ca-40, and Sc-43. Comparisons between the spectra of certain pairs of nuclei are particularly relevant from the viewpoint of the cluster model. Comparisons of the spectra of the following pairs of nuclei are made: N-16, O-17; F-19, Ne-20; K-40, Ca-41; and Sc-43, Ti-44. The cluster model also predicts levels of parity different than the ground state. The relative position of these nuclei are compared in nuclei in which the smallest cluster is varied from a single nucleon to larger clusters. This model further predicts that immediately after double closed-shell structures, nuclei with H-3 or He-3 clusters (e.g., F-19) will exhibit a strong decrease in this excitation energy. Results indicate substructures which are often more important than shell-model structures. (Author)

AD-256 008 Div. 20
(17 May 61) OTS price $1.10

Florida State U., Tallahassee.
CORE RECONSTITUTION IN HEAVY DEFORMED NUCLEI.
by Raymond K. Sheline. (Interim technical rept. no. 2) 1 May 61. 4p. illus. table, 15 refs.
(Grant no. DA-ORD-31-124-61-G50)
(OOR rept. no. 2945:2) Unclassified report

DESCRIPTORS: *Nuclear energy levels, Nuclear states, *Neutrons, *Nuclear structure, Theory, Vibration mechanisms, *Electron transitions, *Nuclei, Deformation, Energy, Neutron flux density.

The deviations are enumerated in the smooth systematics of rotational and vibrational characteristics in the regions of the nuclear periodic table where there is a considerable prolate deformation. These deviations are classified according to their position in the nuclear periodic table. A tentative explanation is presented involving structural changes expected on the basis of the Nilsson level systematics.

AD-256 009 Div. 20
(17 May 61) OTS price $4.60

Florida State U., Tallahassee.
EXPERIMENTAL NUCLEAR ENERGY LEVELS OF Mg-25 AND THEIR INTERPRETATION,
by Raymond K. Sheline and R. A. Harlan. Interim technical rept. no. 3. 1 May 61, 17p. illus. tables, 32 refs.
(Proj. 2945-P; Grant no. DA-ORD-31-124-61-G50)
(OOR rept. no. 2945:3) Unclassified report

DESCRIPTORS: *Nuclear energy levels, *Magnesium, Nuclear shell models, Nuclear models, *Nuclear reactions, Spectrographic analysis, Elastic scattering, Deuteron bombardment, Radioactive isotopes, Alpha particles, Excitation, Nuclear spins, Nuclear states, Theory, Energy, Parity, Quantum mechanics, Aluminum.

By using the reaction Al-27(deuteron,alpha)Mg-25 and a magnetic spectrograph, 66 levels in Mg-25 have been determined below 8.7 Mev excitation. An interpretation of the levels utilizing the Bohr-Mottelson collective model and an empirical rule is attempted. Results indicate that below 4.8 Mev, agreement with the model is good, while above this energy, deviations from experimental level density and energies can be qualitatively explained by additional intrinsic and vibrational states, Coriolis coupling, and the uncoupling of paired nucleons in higher-spin rotational states. A statistical treatment, used in determining the nuclear temperature of Mg-25 as about equal to 2.45 Mev, indicates that the level spacing begins to become smaller than experimental energy resolution above 7.7 Mev. (Author)

AD-256 065 Div. 20, 25
(16 May 61) OTS price $1.60

Uppsala U. (Sweden).
SPIN POLARIZATION EFFECTS IN PARAMAGNETIC MOLECULES,
by Roy McWeeny. 15 Nov 60, 16p. incl. tables. (Technical note no. 57)
(Contract AF 61(052)351)
(ARL-50) Unclassified report

DESCRIPTORS: Atomic energy levels, Atomic orbitals, Molecules, Atomic spectrum, *Nuclear spins, *Paramagnetic crystals, *Polarization, Mathematical analysis, Theory, Quantum mechanics.

The presence of a non-zero spin density in one region of a molecule polarizes the spins elsewhere and thus propagates itself into other regions. A general theory of such effects is presented. (Author)

AD-256 081 Div. 20, 30
(18 May 61) OTS price $8.10

Air Force Special Weapons Center, Kirtland Air Force Base, N. Mex.
THE TRANSPORT OF NEUTRONS THROUGH THE ATMOSPHERE FROM A MONOENERGETIC SOURCE VERSUS TIME OF FLIGHT,
by Ellen M. Hippeli, Donald L. Summers, and Alexander E. Anthony, Jr. Dec 60, 86p. incl. illus. tables (Rept. no. AFSWC TN 60-38)
Unclassified report

DESCRIPTORS: *Nuclear weapons, Nuclear explosions, Numerical methods and procedures, *Neutron flux density, *Neutron scattering, Neutron spectroscopy, Nuclear reactions, Atmosphere, Dose rate, Sampling, Shielding, *Neutrons.

A set of tables is presented depicting the theoretical neutron energy spectrum per initial neutron as a function of transport time for a burst height of 125,000 feet and six sampling altitudes ranging from 50,000 feet to 125,000 feet. These calculations are based on a Monte Carlo code. These data were compared with a previous calculation for the same burst altitude; however, that calculation did not have the time parameter included. Inclusion of the time parameter has not altered the total integrated scattered neutron flux. In the majority of cases, the peak flux occurs in the first 2 milliseconds for initial neutron energies of 14, 10, and 5 Mev; however, for an initial energy of 2 Mev, the peak usually occurs between 3 and 5 milliseconds. (Author)

AD-256 105 Div. 20, 21
(18 May 61) OTS price $12.50

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ATOMIC INDUSTRY,
by P. T. Astashenkov. 15 Nov 60, 177p. incl. tables, 17 refs. (Trans. no. MCL-305 from Atomnaya Promyshlennost, Moscow, pp. 240, 1956)
Unclassified report

DESCRIPTORS: Propaganda, *Atomic energy, USSR, *Atomic energy engineering, Scientific research, Technological intelligence, Production, Communists, *Nuclear energy, *Nuclear power plants, *Nuclear propulsion, Nuclear weapons, Thermonuclear experiments, Uranium, Plutonium, Processing, Sources, Radioactive waste disposal, *Nuclear physics.

Contents:
Beginning of the era of atomic energy
The energy of nuclei fission and the nuclear fuel
Synthesis reaction of nuclei and the thermonuclear fuel
Nuclear energy resources
Processing of atomic raw material
Production of uranium 235
Plutonium and uranium 233 production
Problems on protection against radiations and the removal and use of radioactive wastes
Production of thermonuclear fuel
Atomic industry of capitalist countries
The development of nuclear power engineering
Remarkable prospects

AD-256 192 Div. 20, 14
(26 May 61) OTS price $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
EFFECT OF VACUUM AND ULTRAVIOLET RADIATION ON POLYMERIC MATERIALS. AN ANNOTATED BIBLIOGRAPHY,
comp. by Helen M. Abbott. Apr 61, 26p. 60 refs. (Special bibliography no. SB-61-20)
Unclassified report

DESCRIPTORS: *Polymers, *Coatings, Stability, Ultraviolet radiation, Vacuum systems, *Plastics, *Radiation damage, *Bibliography, Space environmental conditions, Spaceships, High altitude, Plastic coatings, Organic coatings, Deterioration, Low pressure resonance, Materials.

An annotated bibliography is presented consisting of 60 selected references on polymeric materials that have been investigated under the space conditions of vacuum and ultraviolet radiation. The references are arranged alphabetically by author. The following sources were used: ASTIA, LMSD card catalog, Aeronautical Engineering Index: 1957-1955, Resins, Rubber and Plastics: 1960-1955, Nuclear Science Abstracts: 1959-1951, Engineering Index: 1960-1953, Science Abstracts: 1959-1958, Modern Plastics, and Plastics Technology. (Author)

AD-256 194 Div. 20
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE FUTURE OF ATOMIC POWER ENGINEERING IN THE USSR (Budushcheye Atomnoy Energetiki V SSSR),
by V. S. Yemel'yanov. 16 Nov 60. 12p. (Trans. no. FTS-9929 from Nauka i Zhizn, pp. 23-27, Nov 58)
Unclassified report

DESCRIPTORS: *Atomic energy engineering, *Nuclear power plants, Safety, Costs, Heat exchangers, Heat transfer, Uranium, Uranium compounds, Oxides, *USSR, Technological intelligence, Electric power production.

The first atomic electric power station utilizing water as a heat carrier has been in operation in Russia for four years. From the experience gained in the operation of this station and as a result of investigations, construction has been started on large scale industrial atomic electric power stations utilizing natural and enriched uranium. A brief description is given of the stations under construction and those in the planning stage.

Division 20 - NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-256 271 Div. 20, 8, 25
(19 May 61) OTS price $4.60

Lincoln Lab., Mass . Inst. of Tech., Lexington.
CERENKOV RADIATION AND MILLIMETER WAVE APPLICATIONS. PART A,
by Michael S. Macrakis. 3 May 61. 35p. illus.
(Rept. no. 25G-0033)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: Nuclear physics, *Cerenkov radiation, Particles, *Microwaves, Microwave oscillators, Microwave amplifiers, Dielectrics.

In the study of the Cerenkov effect in the production of microwaves, the treatment follows the simplest possible mathematical formulations. Assuming the generalities to be well known, it amounts to formulating and evaluating boundary value problems. Mathematics have been kept in their simplest form. Almost all deductions are made on models consisting of infinite and semi-infinite media traversed by line sources rather than point sources. In principle, point sources can be converted to line sources by integration. Purely formal results were obtained for the cases where fast charged particles traverse infinite and bounded media. In all cases, the charge has been considered as a point line or ring charge, the medium was considered without dispersion and without loss. Thus, an idealized picture is obtained which is far from reality. (Author)

AD-256 310 Div. 20, 25
(19 May 61) OTS price $1.10

Stanford U., Calif.
EXCHANGE-ORDERING AND OBSERVATION OF FORBIDDEN SPIN RESONANCE TRANSITIONS IN CRYSTALLINE ORGANIC RADICALS,
by R. S. Rhodes, J. H. Burgess, and A. S. Edelstein. Apr 61, 4p. illus. 12 refs.
(Technical note no. 131-10)
(Contract AF 18(603)131, Proj. 9751)
(AFOSR-34) Unclassified report

DESCRIPTORS: *Paramagnetic resonance, *Free radicals, *Crystals, Diphenyl, Absorption, Phenyl radicals, Allyl radicals, Benzenes, Nitro radicals, Amines, Carbazoles, Methyl radicals, Organic compounds, *Forbidden transitions, *Nuclear spins.

In examining the E. S. R. (electron spin resonance) spectrum of polycrystalline samples of the organic free radicals picryl-n-amino carbazyl (PAC), 1-3-bis diphenylene-2-phenyl allyl (BDPA), and Wurster's blue perchlorate (WB) at low temperatures and low frequencies, a resonance was observed at g = 4. This line may have arisen from a forbidden transition made possible by the dipolar interaction between spins. In the frequency range from 20 mc to 200 mc the g-value is 4 to within 3% independent of temperature. At fixed temperature the ratio of the peak intensity of the g = 4 resonance absorption to that of the g = 2 absorption decreases with the increasing frequency. At fixed frequency the intensity ratio decreases with increasing temperature and vanishes above a temperature T characteristic of the particular free radical. The intensity ratio decreases with increasing values of the radio-frequency power. The width of the g = 4 resonance appears to be essentially independent of temperature and is of the same order of magnitude as that of the g = 2 resonance. In some cases there is evidence for a g = 6 resonance in the form of a weak bump on the low field side of the g = 4 resonance. (Author)

AD-256 354 Div. 20, 25
(23 May 61) OTS price $5.60

Pittsburgh U., Pa.
FORMATION OF NEGATIVE IONS IN A GAS BY CHARGE TRANSFER FROM A FAST ATOMIC HYDROGEN BEAM,
by T. M. Donahue and Farid Hushfar. Technical rept. no. 4 on Charge Exchange Cross Section. Mar 61. 1v. incl. illus. tables. (Rept. no. 15)
(Contracts DA 36-034-ORD-2912 and Nonr-62406)
Unclassified report

DESCRIPTORS: *Ions, Atoms, Molecules, *Hydrogen, *Electron capture, Spectrographic analysis, Mass spectrometers, Electrons, *Particle beams, Mass spectroscopy.

Structure has been reported in the electron loss cross section for hydrogen atoms in H2. Study of the structure in various gases shows that there is no structure for collisions with argon but nine peaks of magnitude 10 to the -16th cm squared between 8 and 40 Kev in CO. Analysis of these peaks support the idea advanced for hydrogen gas that the peaks are caused by formation of negative ions in the target gas by a process in which the electron is captured as though it were a free electron. Mass spectroscopic study reveals that negative ions are formed when hydrogen atoms pass through CO, H2, O2 and H2O. The formation rate varies in CO as predicted from the loss cross section structure and the cross section is approximately 10 to the -16th cm squared. However the type of ions formed does not support the detailed model of the capture process. (Author)

AD-256 368 Div. 20
(22 May 61) OTS price $9.10

Lockheed Aircraft Corp., Sunnyvale, Calif.
FAST NEUTRON CROSS SECTIONS OF OXYGEN AND NITROGEN,
Final technical rept. 6 Mar 59-20 Feb 61. Feb 61, 1v. incl. illus. tables, 21 refs. (Rept. no. LMSD-895076)
(Contract AF 29(601)1765)
(AFSWC TR 61-15) Unclassified report

DESCRIPTORS: *Nitrogen, *Oxygen, Neutrons, Neutron bombardment, Nuclear spins, *Deuteron cross sections, Deuteron reactions, *Neutron cross sections, Radioactive isotopes, Nuclear physics, Nuclear reactions, Carbon compounds, Nitrogen compounds, Beryllium compounds, Measurement.

Results of research toward measuring the neutron cross sections for nitrogen and oxygen in the neutron energy range from 4 to 12 Mev are presented. New techniques for the use of low-yield and multiple-group neutron source reactions, which were developed to perform these measurements, are shown, along with additional data obtained for the neutron source reactions Be-9 (alpha,n)C-12 and N-15 (d,n)O-16. In addition to the N-14(n,d sub 0)C-13 reaction measurements, the C-13 (d,n)N-14 reaction was investigated to provide additional deuteron stripping data for evaluating the spins and parities of the low-lying states of N-14, and to provide additional information on the reaction mechanism for deuteron induced reactions. Measurements and results are given for the differential elastic, total, and nonelastic neutron cross sections for nitrogen and oxygen at several neutron energies. (Author)

AD-256 482 Div. 20, 25
(23 May 61) OTS price $3.60

General Atomic Div., General Dynamics Corp., San Diego, Calif.
EMISSION OF GAMMA RADIATION AS A FUNCTION OF TIME AFTER PHOTOFISSION OF U238,
by R. B. Walton. Final rept. 11 Feb 61, 41p. incl. illus. (Rept. no. GA-2010)
(Contract AF 29(601)2768)
(AFSWC TR 61-10) Unclassified report

DESCRIPTORS: *Uranium, *Gamma rays, X-rays, *Fission, Radioactive decay, Nuclear reactions, Photons, Neutron capture gamma rays.

The intensity of delayed gamma rays from the photofission of U-238 was measured from 30 microsec to 8 sec after fission. The delayed gamma-ray intensity falls by a factor of about 100 between 30 and 800 microsec after fission, then remains almost constant up to the vicinity of 0.5 sec, beyond which time it decreases at a rate consistent with results obtained by Maienschein (Proc. Second Geneva Conf. P/670, 1958). The present data were normalized to the absolute data of Maienschein in the time region from 1 to 10 sec after fission. Since the apparent half-life of the decay at early times is about 80 microsec, the gamma rays associated with this period probably arise from the decay of one or more fission products formed in isomeric states. Measurements repeated with a bias energy of 510 kev showed the same initial decay characteristic, indicating that some of the gamma rays contributing to the short-lived component have energies greater than 500 kev. In an attempt to evaluate neutron backgrounds using a mercury sample, gamma rays with energies less than about 500 kev and an apparent half-life of 102 microsec were observed. These gamma rays probably resulted from the decay of a mercury reaction product not previously reported. (Author)

AD-256 503 Div. 20
(24 May 61) OTS price $ 1.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
FURTHER ANALYSIS OF GAMMA RAY ATTENUATION IN TWO-LEGGED RECTANGULAR DUCTS,
by A. B. Chilton. 11 May 61. 17p. incl. illus. tables. (Rept. no. TN-412)
(Proj. no. Y-F011-05-329)
Unclassified report

DESCRIPTORS: *Albedo, *Gamma rays, Attenuation, Ducts, *Shelters, Neutrons, *Shielding, Scattering, Neutron detectors.

The use of the albedo approach for the analytical prediction of attenuation characteristics of two-legged rectangular ducts transmitting gamma rays is extended to cases involving the asymmetrical location of source and/or detector. Illustrative problems are presented and solved. (Author)

AD-256 511 Div. 20, 25
(25 May 61) OTS price $14.00

North Carolina State Coll., Raleigh.
HEAT TRANSFER FLUIDS FOR NUCLEAR POWER GENERATION. LITERATURE ABSTRACTS, 1957-1959. 14 Oct 60, 201p.
(Contract Nonr-48603)
Unclassified report

DESCRIPTORS: Liquid metal cooled reactors, Organic liquid cooled reactors, Liquid metal valves, Liquid metal pumps, Power reactors, *Reactor coolants, *Heat exchangers, Alloys, *Heat transfer, *Bibliography, Fluids, Metals, Liquid metals.

The present report is a continuation of the previous report (AD-203 411), with the literature survey being brought up to 1959. In addition, it contains abstracts of pertinent documents which were originally classified material, but have been declassified since the previous report was made. Full use has been made of the Engineering Index, the Chemical Abstracts, and the Nuclear Science Abstracts. The names of the prime authors were used in establishing an alphabetical arrangement of the abstracts. Coauthors are included in the alphabetical listing, with reference being given to the prime author. To aid in recognizing the names of various publications referred to, a listing of the abbreviations for these publications is presented. (Author)

AD-256 550 Div. 20, 4
(24 May 61) OTS price $2.60

Quartermaster Research and Engineering Command, Natick, Mass.
IRRADIATION FACTOR-DEPENDENCY. SOME VINYL MONOMERS. IRRADIATION CYCLE,
ed. by F. Degering, G. J. Caldarella and others. Dec 60. 22p. incl. illus. table. (Radiation Chemistry Laboratory series research rept. no. 4)
Unclassified report

DESCRIPTORS: *Radiochemistry, *Radiation damage, Vinyl radicals, Acrylonitriles, Acrylic resins, Styrenes, Acetates, Butyl radicals, *Polymerization, Dose rate, Temperature.

From the results presented for the irradiation-induced polymerization of the nine monomer systems studied in this series, the following conclusions were reached: (1) something more than a 3-min cycle at 75 C (45-min cycle used as a convenient one in these studies) is the most efficient one for the irradiation-induced polymerization of the systems studied; (2) the efficiency of polymerization on a given time cycle decreases markedly for the higher dose rates used in this study; (3) the relative efficiency of polymerization on a time cycle compared with continuous irradiation appears to decrease with an increase in dose rate; (4) the reaction rate formulations for these systems, derived under vastly different experimental conditions, are not applicable to the parameters used in this study; and (5) the most desirable time cycle and temperature depend on the nature of the monomer system. (Author)

AD-256 551 Div. 20, 4
(24 May 61) OTS price $2.60

Quartermaster Research and Engineering Command, Natick, Mass.
IRRADIATION FACTOR-DEPENDENCY. SOME VINYL MONOMERS: DEGASSING,
ed. by F. Degering, G. J. Caldarella and others. Jan 61. 22p. incl. illus. (Radiation Chemistry Laboratory series research rept. no. 5)
Unclassified report

DESCRIPTORS: *Radiochemistry, *Radiation damage, *Polymerization, *Degasification, Vinyl radicals, Acrylonitriles, Acrylic resins, Styrenes, Acetates, Butyl radicals, Dose rate, Argon.

An evaluation was made of the effect of a single degassing and vacuum or argon on the polymerization of monomer systems by continuous irradiation at 25 C and intermittent irradiation on a 30-min cycle at a temperature of 75 C. The following monomer systems were prepared: acrylonitrile, butyl acrylate, styrene, vinyl acetate, acrylonitrile-styrene, butyl acrylate-styrene, and vinyl acetate-styrene. From the results obtained in these studies the following conclusions were drawn: (2) degassing may significantly increase the yield of polymer obtained by irradiation-induced polymerization; and (2) the relative significance of degassing is a function of the monomer system, the dose rate, and the presence of argon. (Author)

AD-256 552 · Div. 20, 4
(24 May 61) OTS price $2.60

Quartermaster Research and Engineering Command, Natick, Mass.
IRRADIATION FACTOR-DEPENDENCY. SOME VINYL MONOMERS: DEGASSING AND IRRADIATION CYCLE,
ed. by F. Degering, G. J. Caldarella and others. Feb 61. 18p. incl. illus. (Radiation Chemistry Laboratory series research rept. no. 6)
Unclassified report

DESCRIPTORS: *Radiochemistry, *Radiation damage, *Polymerization, *Degasification, Vinyl radicals, Acrylonitriles, Acrylic resins, Styrenes, Butyl radicals, Acetates, Dose rate.

The combined effect of the irradiation cycle and degassing on monomer systems were considered. The monomer systems used in this study were acrylonitrile, butyl acrylate, styrene, vinyl acetate, acrylonitrile-styrene, butyl acrylate-styrene, and vinyl acetate-styrene. Something more than a 3-min cycle, with the parameters used, was required for an optimal yield of polymer at a given dose rate and dose level. The effects of both degassing and the irradiation cycle were dependent to some extent at least on the monomer system. The effect of degassing was more dependent on the monomer system than was the effect of the irradiation cycle. The relative composite effect of degassing and the irradiation cycle decreased in general with an increase in dose rate and total dose. (Author)

AD-256 553 Div. 20, 4
(24 May 61) OTS price $2.60

Quartermaster Research and Engineering Command, Natick, Mass.
IRRADIATION FACTOR-DEPENDENCY. SOME VINYL MONOMERS: MULTIPLE PARAMETERS,
ed. by F. Degering, Flora E. Evans, and Stephen Grib. Mar 61. 25p. incl. illus. (Radiation Chemistry Laboratory series research rept. no. 7)
Unclassified report

DESCRIPTORS: *Radiochemistry, *Radiation damage, *Polymerization, Degasification, Vinyl radicals, Acrylonitriles, Acrylic resins, Styrenes, Butyl radicals, Atetates, Air.

The effect of fifteen factors, singly or combined, on vinyl monomers are presented. The monomer systems used in this study were acrylonitrile, butyl acrylate, styrene, vinyl acetate, acrylonitrile-styrene, butyl acrylate-styrene, vinyl acetate-styrene, acrylonitrile-vinyl acetate, butyl acrylate-vinyl acetate, and 1,1,3-trihydroperfluoropropyl acrylate. From the data presented in the report it was concluded that the effect of: (1) air on a degassed system is dependent on the monomer system; (2) flame-out of the tubes is dependent on the monomer system; (3) degassing once, twice, or three times is dependent on the monomer system; (4) the combination of flame-out and degassing is also dependent on the monomer system; and (5) heating at 75 C in combination with 3 flame-outs and 3 degassings is significantly more effective in increasing the amount of polymer in the 8 systems studied than is the use of a temperature of 25 C. An indication was also observed that a minimum amount of both moisture and oxygen may be desirable for optimal polymerization of certain monomers with a given set of parameters. (Author)

AD-256 743 Div. 20, 30
(31 May 61) OTS price $1.60

Air Force Special Weapons Center, Kirtland Air Force Base, N. Mex.
TEST RESULTS, NUCLEAR RADIATION MEASURING AND RECORDING SET, A/E 33D-1 (XV-1),
by Alvin E. Smith. Apr 61, 13p. incl. illus. table (Rept. no. AFSWC TN-61-5)
(Proj. 8808)
Unclassified report

DESCRIPTORS: *Gamma counters, Gamma emission, *Nuclear explosions, Detection, Fission, *Radioactive fall-out, Scintillation counters, Measurement, Tests, Radiation instruments.

This report describes the operation, performance, and various tests conducted on the Nuclear Radiation Measuring and Recording Set, A/E 33D-1 (XV-1). The radiation response and environmental test procedures and parameters are described and their results presented. The set failed the high and low temperature and lower energy radiation response testing. The major engineering problem areas are discussed. An additional development effort will be required before the set can comply with performance specifications. (Author)

AD-256 807 Div. 20
(29 May 61) OTS price $4.60

Naval Radiological Defense Lab., San Francisco, Calif.
CALCULATION OF RADIATION DOSE RATE FROM CYLINDRICAL AIRBORNE FISSION-PRODUCT SOURCES,
by E. S. Shapiro and I. O. Huebsch. 1 May 61, 36p. incl. illus. tables (Research and development rept. no. NRDL-TR-507)
Unclassified report

DESCRIPTORS: Tables, *Nuclear explosions, *Dose rate, Fission, *Fission products, Fission product activity, Radioactive fall-out, Gamma emission, Gamma rays, Airborne, Numerical analysis, Determination, Energy, Radiation counters, Sources.

A mathematical expression for radiation dose rate is developed for the case of a cylindrical source, using an effective attenuation coefficient for the spectrum of gamma ray energies of the fission-product mixture for a given time

after fission. The expression has been evaluated numerically, and the resulting dose-rate ratios are presented in tabular form for various sizes of cylinder and distances from cylinder axis to receiver. The results are presented in tables of dose-rate ratios, that is, the ratio of the dose rate at a given distance from a cylindrical source of given dimensions and activity density to the dose rate within an infinite homogeneous volume having the same activity density. A rapid, approximate method of determining many additional values of the dose-rate ratio is given. (Author)

AD-256 884 Div. 20, 7, 25
(2 June 61) OTS price $10.10

Atomics International, Canoga Park, Calif.
ENERGY CONVERSION SYSTEMS REFERENCE HANDBOOK. VOLUME X - REACTOR SYSTEM DESIGN.
Sep 60, 111p. incl. illus. tables, 37 refs.
(EOS rept. no. 390-Final)
(Subcontract to Electro-Optical Systems, Inc., Pasadena, Calif., Contract AF 33(616)6791, Proj. 4769)
(WADD TR 60-699, vol. 10) Unclassified report

DESCRIPTORS: *Handbooks, *Power supplies, *Nuclear power plants, Design, Spaceships, Space flight, Satellite vehicles, Shielding, *Nuclear energy, Heat transfer, Fluid flow, Heat, Thermal radiation, Fluid mechanics, Materials, Radiation effects, Reliability, Radiation damage, Safety, Radiation hazards, Reactor hazards, Reactor shielding materials, Reactor safety systems.

Various aspects of reactor design are discussed with respect to inherent limitations and system requirements and many problems which are common to all nuclear systems such as shielding, reliability, heat rejection, and safety are outlined in some detail. (Author)

AD-256 885 Div. 20, 15
(2 June 61) OTS price $4.60

Stanford U., Calif.
PERIPHERAL CONTRIBUTIONS TO HIGH-ENERGY INTERACTION PROCESSES,
by S. D. Drell. Feb 61, 37p. incl. illus. tables
(Technical note no. 35;388-35)
(Contract AF 49(638)388)
(AFOSR no. 427) Unclassified report

DESCRIPTORS: *Nuclear reactions, Mesons, Nuclear physics, *Scattering, Perturbation theory, Elastic scattering, Mathematical analysis, Particles, *Nucleons, *Pions.

Interaction processes at high energies and low momentum transfers are analyzed and reviewed in terms of the peripheral collision approximation. Experimental results are analyzed, new experiments are proposed, and practical consequences of some of the results for high-energy accelerators are discussed. (Author)

21. NUCLEAR PROPULSION

AD-256 792 Div. 21, 27
(29 May 61) OTS price $1.60

AVCO Research Lab., Everett, Mass.
AN ELECTROMAGNETIC ROCKET SYSTEM OF HIGH SPECIFIC THRUST,
by R. J. Rosa. Apr 58. 10p. incl. illus. (Research rept. no. 103)
(Contract AF 49(638)61, Proj. 9751)
(AFOSR-461) Unclassified report

DESCRIPTORS: Rockets, Thrust, *Rocket motors, *Magnetohydrodynamics, Power reactors, Generators, *Ion rockets, Turbines.

A nuclear-electric propulsion system is described which avoids the necessity for a low temperature heat sink. The system is an open thermodynamic cycle which in effect re-uses the working fluid several times without recirculating it. Although a very large specific impulse cannot be produced in this manner it does seem possible to get a substantial improvement in the impulse obtainable for a given nuclear pile temperature. In addition, the elimination of the heat sink increases the possibility of making nuclear-electric systems having a high thrust to weight ratio and an ability to function within the atmosphere. (Author)

Division 22 - ORDNANCE
22. ORDNANCE

AD-256 010 Div. 22, 30
(17 May 61) OTS price $3.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
CRITICAL STUDY ON THE PREDETERMINATION OF THE LIFE OF POWDERS AND EXPLOSIVES,
by Werner Hjalmar Gross, tr. by U.S. Joint Publication Research Service. May 61, 28p. incl. illus. tables (Technical notes no. FRL TN 72; Trans. of Explosivstoffe 7:71-76, 1959)
Unclassified report

DESCRIPTORS: *Propellants, Nitrocellulose, *Powders, *Explosives, Cellulose nitrates, Storage, Life expectancy, Test methods, Determination, Mathematical analysis, Theory, Nitroglycerin.

Up to a certain point it is possible to determine the residual life of a powder. In the case of explosives, it is also possible to employ one of the methods described, provided that catalytic influences are excluded. If a standard explosive and a standard powder with a definitely known lower life limit is used, the area method would appear to have great advantages, since it is based on a dynamic test, like the hydrolytic Muraour test. The method of experimental coefficients is considered more advantageous than the method of fixed coefficients. The residual stabilizer test seems to be relatively reliable only when the law of consumption of stabilizer, probably exponential rather than linear, is fairly accurately known. As far as Carneiro's formula is concerned, it is useful on account of its practical convenience and almost always leads to satisfactory results. Whenever possible, any attempt at predetermination should be based on thermal tests at low temperatures. (Author)

AD-256 052 Div. 22
(17 May 61) OTS price $8.60.

Ammunition Group, Picatinny Arsenal, Dover, N. J.
EVALUATION TESTS AND PROCESS STUDIES RELATING TO ESTABLISHMENT OF SUBSTITUTE FOR BLACK POWDER (IMPROVEMENTS IN MANUFACTURE OF BENITE STRANDS)
by E. Huselton and S. Kaplowitz. Apr 61, 1v. incl. illus. tables.
(Technical rept. no. DB-TR: 5-60)
Unclassified report

DESCRIPTORS: *Igniters, *Primers, *Powder, Extrusion, Potassium compounds, Nitrates, Specifications, Stability, Sensitivity, Storage, Guns, Firing mechanisms, Production, Processing, Nitrocellulose, Preparation,

A realistic acceptance specification for benite strands was prepared. Conventional Ordnance manufacturing equipment may be used. Technical grade potassium nitrate is satisfactory. Increasing the drying temperature to 131 F reduces drying time from 10 days to 12 hours. Reworking doubles the yield. Stability is improved by substituting diphenylamine for ethyl centralite. Processing characteristics are improved by the use of ethyl acetate and alcohol as solvents instead of diethyl ether and alcohol. Multiple-orifice plates for extrusion and dowels for drying of the strands are recommended for high capacity production equipment. Benite colloid does not detonate under severe conditions of confinement; it is accordingly considered a Class 2 explosive hazard (fire hazard) for extrusion. The performance characteristics of benite are relatively insensitive to minor changes in formula and dimensions. (Author)

AD-256 203 Div. 22
(17 May 61) OTS price $1.10

Atlas Powder Co., Tamaqua, Pa.
DEVELOPMENT AND FABRICATION OF THE T-68 ELECTRIC DETONATOR,
by H. L. Hulka. Monthly progress rept. no. 14, 1-30 Apr 61. May 61. 2p. illus.
(Contract DA 36-034-501-ORD-3183, Proj. TA 1-2707)
Unclassified report

DESCRIPTORS: *Electric detonators, Acrylic resins, Manufacturing methods, Manufacturing methods, Insulating materials, Electric primers, Primers, Design.

Continued progress is reported on the staked button assembly for the T-68 primer. Using LECTON acrylic resin insulated rod, 137 buttons were assembled by staking at the face of the button assembly. These assemblies were baked at +325 F for 16 hours, faced, and then graphited. Ninety-eight of the 137 were perfect after these operations. (Author)

AD-256 278 Div. 22, 3
(19 May 61) OTS price $1.60

Ammunition Group, Picatinny Arsenal, Dover, N. J.
COMPATIBILITY OF GB AND VX AGENTS WITH RDX, TETRYL, COMPOSITION B AND 70/30 TETRYTOL,
by Robert T. Schimmel and Stanley J. Lowell. Apr 61, 16p. incl. illus. tables. (Technical memo. no. ORDBB-DR4-41)
Unclassified report

DESCRIPTORS: *Explosives, *RDX, Anilines, Nitro radicals, Methyl radicals, High explosive ammunition, Contamination, *V agents, *G agents, Chemical warfare agents, Tests, Sensitivity, Test methods, Powders, Detonators, Primers, *Tetryl.

Since the possibility exists that GB and VX agents could come in contact with the explosive in chemical shell, a series of tests was conducted to determine the possible consequences. The explosives tested were Composition B, RDX, tetryl and 70/30 tetrytol. When explosive and agent were mixed, there was no immediate reaction although after 5 hours all the mixtures except RDX/VX were partially decomposed. Samples of agent-contaminated explosives inclosed in test vehicles did not explode when subjected to temperature cycling, rough handling and physical shock. At the conclusion of these tests, blasting caps and boosters were attached to the samples to determine if the samples could be explosed. All of the control samples as well as the VX-contaminated RDX, 70/30 tetrytol and half of the tetryl samples exploded. All of the other agent-contaminated explosive samples partially exploded (explosive residue noted). Where partial explosions occurred it was assumed that the samples were desensitized. (Author)

AD-256 318 Div. 22
(22 May 61) OTS price $1.10

Army Armor Board, Fort Knox, Ky.
TEST OF GUN, SELF-PROPELLED, FULL-TRACKED, 175-MM, T235E1,
26 Apr 61, 6p. (Proj. no. 2091)
Unclassified report

DESCRIPTORS: *Self-propelled guns, Tanks, Tests, Howitzers, *Tracked vehicles, Guns, Military requirements, Maneuverability, Transport planes, Reliability, Maintenance, Safety.

Tests were conducted on a 175mm self propelled, full-tracked gun. The test vehicle was operated 4,045 miles and 39 rounds of high-explosive ammunition were fired at maximum charge. It was considered satisfactory with respect to road mobility, cross-country mobility, fuel and oil consumption, cruising range, compatibility with related equipment, security, ease of operation and crew safety (driver only) and comfort, stowage of automotive equipment, and air transportability. The main equipment failures were a broken transmission auxiliary drive and a travel lock failure. (Author)

AD-256 319 Div. 22
(22 May 61) OTS price $1.10

Atlantic Research Corp., Alexandria, Va.
STUDY AND ANALYSIS OF MEDIUM MORTARS,
by T. J. O'Donnell and D. D. Dunfee. Monthly progress rept. no. 9, 1-30 Apr 61. 30 Apr 61, 5p.
(Contract DA 30-144-503-ORD-1288)
Unclassified report

DESCRIPTORS: *Mortars, Design, Tests, Gun barrels, Military requirements, Gun mounts, Accelerometers, Firing mechanisms, Ballistics, Instrumentation.

Continued research is presented on medium mortars. Laboratory evaluations of the piezo accelerometers on the vertical drop hammer were completed. The results of these final tests are summarized as follows: (a) In the tests at the 300-600 level, the lowest tranverse response of any accelerometer tested was in excess of 9% with response in some units ranging as high as 43%, and (b) In tests at the 1,000 G level, the lowest tranverse response of any accelerometer tested was in excess of 12% with response in some units ranging as high as 54%. It is concluded that most of the accelerometers response to high level transverse accelerations is the result of cantilevering and other mechanical loads induced into the accelerometer case by these high level transverse accelerations. The mechanical loads are transmitted to the crystal stack, translated into electrical response and appear as spurious acceleration profiles on the record. (Author)

AD-256 336 Div. 22
(22 May 61) OTS price $7.60

Ordnance Tank-Automotive Command, Detroit, Mich.
THE TURNING BEHAVIOR OF ARTICULATED TRACK-LAYING VEHICLES,
by D. C. Clark. Mar 60. 74p. incl. illus. (Rept. no. RR-16; Rept. no. LL-58)
Unclassified report

DESCRIPTORS: *Tracked vehicles, Vehicles, *Maneuverability, Mathematical analysis, Differential equations, Soils, Acceleration, Control, Non-linear differential equations, Trafficability.

The turning behavior of articulated vehicles was investigated to determine the optimum configuration for a two-unit articulated vehicle. A system of non-linear differential equations was developed to describe the turning performance of an articulated vehicle performing on hard ground at low centrifugal accelerations. It was found that for these conditions, vehicle response is linear and a function of geometry only. (Author)

AD-256 338 Div. 22, 10
(22 May 61) OTS price $1.60

Bureau of Mines, Pittsburgh, Pa.
STUDIES ON DEFLAGRATION TO DETONATION IN PROPELLANTS AND EXPLOSIVES,
by F. C. Gibson, C. R. Summers, and F. H. Scott. Quarterly rept. 1 Jan-31 Mar 61. 10 May 61, 16p. incl. illus.
(ARPA Order no. 44-61) Unclassified report

DESCRIPTORS: *Propellants, *Explosives, *Detonation, *Combustion, Sensitivity, Detonation waves, Pressure vessels, Electric fields, Shock waves, Temperature, Pressure, Oscilloscope probes, Oscillograms, Propellant grains, Ionization.

The U. S. Naval Propellant Plant high-performance double-base propellant was tested under extreme confinement. Thus far it has been impossible to attain a transition from deflagration to detonation in this material, in spite of the fact that the confined critical diameter is only about 1.5 cm when directly initiated by explosive-generated shock waves. Some basic experiments have been conducted, using simple probe systems to determine electron and ion activity in the reaction zone of a detonating explosive. Ultimately it may be possible to prevent a transition by applying externally generated electric and/or magnetic fields. A pressure probe system for the continuous display of compression wave velocities was developed and applied to delayed detonation in explosives as well as to pressure waves in an inert liquid body. The indications are that such a system may be used effectively to reveal pre-detonation pressure waves in opaque solids under heavy confinement. (Author)

AD-256 369 Div. 22
(22 May 61) OTS price $2.60

Lake City Arsenal, Independence, Mo.
STUDY OF VARIABLES AFFECTING CRUSH-UP IN RAMMING OF CASE, CARTRIDGE, M103 AND M103B1 IN GUNS M39 AND T171,
by H. L. Bindi. Apr 61, 28p. incl. illus. tables
(IED rept. no. 61-7)
(Proj. OAC 56-182)
Unclassified report

DESCRIPTORS: Brass, Steel, Deformation, *Cartridge cases, *Physical properties, Tests, Ammunition, Pressure, Test equipment, Test methods, Firing mechanisms, *Aircraft guns, *Automatic weapons, *Failure (Mechanics), *Guns.

Laboratory tests were conducted on modified 20mm brass and steel cases to determine amount of force required to cause case crush-up and permanent deformation. This was accomplished by applying a measured force against the head of the case held in a gun chamber and then measuring the deflection of the case under pressure. The pressure is then released and the permanent deformation measured. Comparing results of laboratory crush tests conducted on the modified brass and steel cases showed that the force required to establish a permanent deformation of .015 was approximately three times as great for

the steel case. Cases incorporating a series of modifications were manufactured and assembled into cartridges for actual firing tests. Results of firing tests conducted using the T171 gun indicated that modification to the brass M103 or steel M103B1 case is not necessary. This is because of modification made to the T171 gun chamber eliminating the excessive resistance to case crush-up. The effect of case modifications as studied did not improve or adversely affect the functioning of the M39 gun. Accordingly, no changes to present case dimension are recommended. (Author)

AD-256 411 Div. 22, 13, 20
(22 May 61) OTS price $3.60

Rand Corp., Santa Monica, Calif.
PRESSURE RESPONSE WITHIN AN ENCLOSURE SUBJECT TO A BLAST WAVE,
by W. R. Elswick. 1 Mar 61, 31p. incl. illus.
(Research memo. no. RM-2660)
(Contract AF 49(638)700)
Unclassified report

DESCRIPTORS: Nuclear explosions, *Atomic bomb explosions, Mathematics, Pressure, Buildings, *Underground structures, *Shelters, Battle shelters, Personnel, *Blast, *Air raid shelters.

A generalized mathematical model is presented of the rise of pressure with time within an enclosure as a function of enclosed volume, leakage-opening area, static overpressure, and nuclear weapon yield. The results are shown graphically. Their applicability to the design of protected enclosures is illustrated by two examples of personnel shelters: a small home shelter, and a considerably larger arrangement housing up to a hundred people. (Author)

AD-256 442 Div. 22, 25
(22 May 61) OTS price $2.60

Watervliet Arsenal, N. Y.
ELASTIC-PLASTIC ANALYSIS OF CLOSED-END TUBES,
by C. D. Sutherland and R. E. Weigle. July 60, 25p. incl. illus. (Technical rept. no. WVT RR 6015 R)
(DA Proj. 501-01-033)
Unclassified report

DESCRIPTORS: *Stresses, *Plastic flow, *Gun barrels, *Interior ballistics, Pipes, Guns, *Artillery, *Elasticity, Pressure, Mathematical analysis.

An approximate solution is derived for the stresses in a circular, closed-end, unrestrained tube subjected to an internal pressure of sufficient magnitude to induce plastic flow. The Mises yield criterion is assumed in the plastic region of the tube. The radial and circumferential stresses are found to be in good agreement with those for the plane stress case. Results are shown graphically. (Author)

AD-256 464 Div. 22
(24 May 61) OTS price $2.60

Aberdeen Proving Ground, Md.
PRELIMINARY HEAT-TRANSFER EVALUATION OF MORTAR, 81-MM, T227E2 MODIFIED WITH COPPER COATING,
by F. B. Poughkeepsie. May 61, 19p. incl. illus.
(Rept. no. DPS-215)
Unclassified report

DESCRIPTORS: *Heat transfer, *Mortars, *Gun barrels, Tests, Copper coatings.

This test was conducted to obtain a preliminary evaluation of the firing capabilities of an 81-mm mortar, T227E2, modified with a heat-sink materiel (copper) applied to the exterior of the barrel. Firings consisted of a proof test, and limited rapid-rate-of-fire tests using the 81-mm, M362 cartridge at charges 6 and 8. It was indicated from the limited test data that the T227E2 mortar barrel modified with a copper coating applied to its exterior did to some extent permit an increase in the number of rounds which could be rapid-fired before attaining the temperature limitation established for the barrel. As a result of the effects from firing, considerable loosening of the copper coating from the mortar barrel and numerous cracks were evident. Since the T227E2 mortar barrel modified with copper coating and the experimental XM-1 barrel (previously tested) exhibited approximately the same heat-transfer characteristics, it is recommended that future studies be directed towards developing the XM barrel in preference to a barrel with copper coating. (Author)

AD-256 571 Div. 22
(25 May 61) OTS price $4.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
THEORETICAL LIGHT-GAS GUN PERFORMANCE,
by W. B. Stephenson. May 61. 49p. incl. illus. table. (Rept. no. AEDC TR 61-1)
(Contract AF 40(600)800)
Unclassified report

DESCRIPTORS: *Hypervelocity guns, Helium, *Interior ballistics, *Gas flow, Tests, Compression shock, Gun barrels, Propellants, Launching, Test equipment, Gun launched.

One-dimensional, unsteady flow theory of an ideal gas is reviewed as it applies to guns and ballistic model launchers. The method of characteristics is developed for the general case including chambrage and finite chamber volume. Results for helium as a propellant are given from which the required chamber size can be determined. The launch velocity for combinations of launch tube and chamber geometries is computed assuming no friction nor heat loss and an evacuated bore. (Author)

AD-256 593 Div. 22
(5 June 61) OTS price $3.60

Naval Ordnance Labs., White Oak, Md.
THE MECHANISM OF THE TRANSITION FROM DEFLAGRATION TO DETONATION IN HIGH EXPLOSIVES,
by Carl T. Zovko. Doctor's thesis. 14 Apr 61, 30p. incl. table, 12 refs.
(In cooperation with Catholic U. of America, Washington, D. C.)
(NAVWEPS rept. no. 7393) Unclassified report

DESCRIPTORS: Explosives, *Explosions, *Detonation, Decomposition, Shock waves, Detonation waves, Combustion, Equations of state, Mathematical analysis, Theory, Reaction kinetics.

Experimental results of the study of spontaneous transition from deflagration to detonation indicate that the approach to the problem can be in two stages; the first is the formation of a shock from pressure waves engendered by a confined deflagration, and the second the shock-initiation

of detonation. A program for the analytical treatment of the first stage was written for the IBM 704. Two numerical codes have been tested, one based on the so-called q-method and one which avoids amplitude fluctuations inherent in the q-method and thus gives a more realistic representation of a shock wave. Representations of spontaneous shock formation obtained by the two numerical codes and by the analytical treatment are discussed and compared. The numerical methods yield the temperature as a function of time and location during growth of the shock and thus allow a study of simple chemical kinetic models. Introduction of chemical kinetics into the program gives a basis for elucidation of the second stage of the transition problem, namely shock-initiation of detonation. (Author)

AD-256 622 Div. 22
(26 May 61) OTS price $1.60

Aberdeen Proving Ground, Md.
DEVELOPMENT OF 90-mm, SPIRAL-WRAPPED CARTRIDGE CASE,
by R. N. Dempsey. May 61, 1v. incl. tables.
(Rept. no. DPS-237)
Unclassified report

DESCRIPTORS: *Cartridge cases, Pressure, Temperature, Tests, Design, Steel, Sheets, Ordnance steel.

The spiral-wrapped, 90-mm cartridge case for use in the M36 and M41 guns was developed to supplement the drawn-steel and brass cases because of its low cost and ease of manufacture. This ballistic test was conducted to determine optimum thickness of the body and to further test the three-piece-designed case. The two designs of case tested had body thicknesses of 0.023 to 0.025 inch (Design A) and 0.029 to 0.031 inch (Design B). Both designs performed satisfactorily when fired at -25 F and in the low-pressure (30,000 psi) regions at 70 F. However, the Design B cases were superior when fired at excess pressure (52,600 psi) at 70 F. (Author)

AD-256 626 Div. 22
(26 May 61) OTS price $4.60

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
CRATER AND PERMANENT DISPLACEMENT MEASUREMENTS FROM A FIVE-TON SURFACE EXPLOSION; U. S. PROJECT 1.6, CANADIAN HE TEST PROGRAM, 1959,
by J. N. Strange, W. L. Wallace, and W. E. Strohm. Apr 61, 40p. 14 refs. (Miscellaneous Paper no. 2-424)
Unclassified report

DESCRIPTORS: *Explosions, Soils, Test equipment, Tests, Measurement, *Blast, Clays, Sand, Density, TNT, Cratering, *Shaped charges, Physical properties, Determination.

Personnel of the Waterways Experiment Station in cooperation with personnel from the Ballistics Research Laboratory and the Naval Ordnance Laboratory participated to a limited extent in the Canadian HE Test Program, which was conducted at the Suffield Experimental Station during the period September-October 1959. Measurement was made of the apparent and true craters, and the permanent displacements along the ground surface produced by the detonation of a 5-ton, HE, surface shot on 29 September. A detailed soil survey of the media cratered was also made. Results of the test showed that the apparent and true craters were 40.0 and 41.0 ft wide and 12.3 and 15.8 ft deep, respectively, and that cube root scaling proved adequate for both radius and depth of crater. Ground surface displacements ranged from 1.3 ft at 1.0 lambda (21.6 ft) away from ground zero to no observable displacement beyond 6.0 lambda (129.5 ft) from ground zero where lambda is the reduced horizontal distance. (Author)

AD-256 634 Div. 22, 3
(26 May 61) OTS price $2.60

Dugway Proving Ground, Utah.
ENVIRONMENTAL TESTS OF SHELL, GB-FILLED, 105mm, M360 SHELL, GB-FILLED, 155mm, M121.
Mar 61, 26p. incl. illus. table (Technical rept. no. DPGR 272)
Unclassified report

DESCRIPTORS: *G-agents, *Projectiles, Tests, Desert tests, *Storage, Chemical analysis, Climatic factors, Arctic regions, Deterioration, Pressure, Tropical regions, *Chemical projectiles, Chemical warfare agents.

Tests were conducted to determine by inspection and chemical analysis, the storage stability of the 105mm and 155mm GB-filled howitzer shell under arctic, desert, temperate, and tropic environments. Results revealed that the GB is stable during the storage and test period in four climatic environments. The GB was manufactured and filled in the shell in 1955. Counting the time between manufacture, entry into the program, and termination of environmental testing the agent was proven stable for at least 5 years. No agent leaked from either type of shell. The pressure build-up was negligible. The rate of GB deterioration as revealed by chemical analysis on a cyclic test basis was not significant during the storage period. The storage stability of the munition and the agent was satisfactory. (Author)

AD-256 738 Div. 22
(31 May 61) OTS price $2.60

Aberdeen Proving Ground, Md.
THE REVIEW AND ANALYSIS OF PRODUCTION TEST DATA 280-MM GUNS, T131,
by Harry H. Rauscher. Rept. no. 5. May 61, 1v. incl. illus. tables (Rept. no. DPS-229)
Unclassified report

DESCRIPTORS: *Guns, *Gun barrels, Tests, Production, Specifications, Acceptability, Measurement.

The data pertaining to the acceptance testing of the 280-mm gun, T131 and related materiel from 1952 through 1956 have been reviewed to determine as accurately as possible the various steps required in the proof acceptance test to determine what factual data have been obtained from the proof test and whether or not some modification of the test is in order. The information contained in this report indicates a very low percentage of cannon or component rejects (less than one per cent of the total inspected). The failures were not considered of a hazardous type and could be corrected. This is a complete report on the review and analysis of all the data available at Aberdeen Proving Ground on the 280-mm, T131 gun. A study of other artillery weapons is in progress and results will be reported in the future. (Author)

AD-256 778 Div. 22, 6, 30
(29 May 61) OTS price $4.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
AN ASSESSMENT OF READOUT ERRORS ENCOUNTERED IN RADIO TELEMETRY FROM GUN-LAUNCHED HYPERVELOCITY PROJECTILES,
by M. K. Kingery and P. L. Clemens. May 61, 43p. incl. illus. tables, 10 refs. (AEDC TN 61-58)
(Contract AF 40(600)800)
Unclassified report

Presented as Progress in the Development of a Radio Telemetry System for Use with Gun-Launched Hypervelocity Projectiles at the National Telemetering Conference, Chicago, Illinois, May 22-24, 1961. (Jointly sponsored by ARS, AIEE, IAS, ISA, and IRE)

DESCRIPTORS: *Hypervelocity guns, Stresses, *Telemeter systems, Telemetering, Hypervelocity projectiles, Acceleration, Transducers, *Instrumentation, *Errors, Tests, Pressure, Simulation, Exterior ballistics, Aerodynamics, Telemetering data, Radio equipment, Telemetering transmitters, Test methods, *Test facilities, Sensitivity.

When gun-launched, hypervelocity, aerodynamic models are tested, the radio telemetry apparatus contained within the test projectiles must withstand peak accelerations of approximately 500,000 g. Recent progress in the development of radio telemetry instrumentation for use in an altitude simulating, aeroballistic range is discussed. The sources of error in the telemetered data are evaluated theoretically, and supporting experimental data are presented. An in-flight pressure telemeter calibration technique is described; static compression tests are described. Errors arising out of fluctuations in carrier frequency and telemeter sensitivity changes are analyzed. (Author)

AD-256 819 Div. 22
(1 June 61) OTS price $8.10

Aberdeen Proving Ground, Md.
COMBINED ENGINEERING-USER TESTS OF FIRING MECHANISM XM35,
by J. S. Whitcraft. May 61, 24p. 1v. incl. illus. tables. (Rept. no. DPS-245)
Unclassified report

DESCRIPTORS: *Firing mechanisms, Primers, Tests, Self-propelled guns, *Howitzers, Electric primers, Safety, Test methods, Reliability.

The XM35 firing mechanism was tested on the new 155-mm howitzer, T255E2 (primary armament of the T196E1 self-propelled vehicle), under various conditions, using XM82 (percussion), MK 15, Mod 2 and T106E1 (electric/percussion) primers. The over-all performance of the firing lock was satisfactory; however, a second attempt was necessary to fire some of the electric/percussion primers. Related howitzer components necessary for installing and firing the mechanism (XM35) presented some minor difficulties that will be examined in more detail during testing of the weapon system. (Author)

AD-256 104 Div. 23
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INCREASING THE LEVEL OF INSTRUCTION IN ACADEMIES, 15 Nov 60, 5p. (Trans. no. MCL-297 from Sovetskaya Aviatsiya 264:1, 7 Apr 57)
Unclassified report

DESCRIPTORS: *Military training, Air Force, Aviation personnel.

AD-256 209 Div. 23, 28, 30
(18 May 61) OTS price $8.10

Washington U., St. Louis, Mo.
METHODS OF RESEARCH IN TECHNICAL TRAINING, ed. by Philip H. DuBois and Winton H. Manning. Revised edition, Apr 61, 80p. incl. illus. tables, 129 refs. (Technical rept. no. 3)
(Contract Nonr-81602)
Unclassified report

DESCRIPTORS: Conferences, *Training, *Learning, *Scientific personnel, Psychometrics, Measurement, Statistical analysis.

AD-256 342 Div. 23
(22 May 61) OTS price $8.60

Courtney and Co., Philadelphia, Pa.
AVIATOR ESCAPE SYSTEM TRAINING,
by James W. Danaher and Anthony Sylvestro. Technical rept. 1 Mar 61, 94p. incl. illus. 93 refs.
(Contract N61339-880)
(NAVTRADEVCEN 880-1) Unclassified report

DESCRIPTORS: *Aviation safety, Ejection seats, Bailout, Training, Military training, Naval aviation, Naval aircraft, *Aviation personnel.

The purposes of this study were to investigate Naval escape system training needs and to provide information upon which recommendations could be made to improve training procedures and devices. These data were gathered by means of a literature study; a Pilot Questionnaire; interviews with equipment manufacturers and training specialists; review and analysis of ejection accident data; and a training film survey. Recommendations were made regarding: the standardization of equipment and procedures involved in ejection, parachuting, ditching and survival; dissemination of accident information to all pilots; added realism in training devices; and a more holistic approach to escape training. (Author)

AD-256 346 Div. 23, 1, 19, 28
(22 May 61) OTS price $7.60

Dunlap and Associates, Inc., Stamford, Conn.
RELATIVE MOTION. III. SOME RELATIVE MOTION PROBLEMS IN AVIATION,
by Charles R. Kelley, Sybil de Groot, and Hugh M. Bowen. Jan 61, 67p. incl. illus. tables, 12 refs.
(Contract N61339-316)
(NAVTRADEVCEN 316-2) Unclassified report

DESCRIPTORS: *Motion, Perception, Navigation, *Training, *Training devices, Errors, Display systems, Pilots, Guidance, Flight, *Flight attitude indicators, Navigators.

This study was conducted for the purpose of exploring relative motion problems in a variety of pilot and navigator tasks. Field studies surveyed methods used by pilots to fly intercepts; analyzed the guidance of air-to-ground missiles; and identified relative motion problems in at-

titude and navigation displays including the ANIP display. In addition, two experiments were carried out to determine natural responses to inside-out displays as a function of display size, and to determine how to eliminate wrong responses to roll information presented on such displays (reversal errors). The study confirmed the superiority of outside-in displays, made specific recommendations for the design of navigation and attitude displays for air- and spacecraft, and suggested ways of eliminating reversal errors. It also recommended procedures for missile guidance, and provided insights into the cues that pilots use in visual intercepts. (Author)

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-256 480 Div. 24, 1, 16
(23 May 61) OTS price $3.60

National Aviation Facilities Experimental Center, Atlantic City, N. J.
DEVELOPMENT OF A HEAD-MOUNTED CAMERA FOR RECORDING PILOTS' EYE MOVEMENTS,
by E. E. Pazera. Mar 60, 1v. incl. illus. (Task assignment no. TA 59-205.9)
Unclassified report

DESCRIPTORS: Cameras, *Motion picture cameras, Human engineering, Optometry, *Eye, *Pilots, Flight instruments, Motion, Cockpits, *Photographic analysis.

To fulfill the need for a satisfactory method of evaluating visual performance, a compact, head-mounted camera was developed which records simultaneously the pilot's eye movements and a portion of the field of view in the direction in which his head is pointed. The head-mounted pilot eye-movement recording camera contains a 16 mm movie camera with rotating disc shutter, 9.5 mm (f2.2) Angenieux wide-angle lens, and 100-ft film capacity. The entire unit, including film, weighs 4.5 lbs. It is electrically driven by an internally regulated 28-v motor, and is activated by a bead-chain drive. It may be operated from either aircraft power or a camera battery pack. (Author)

Division 25 - PHYSICS
25. PHYSICS

AD-256 012 Div. 25, 17
(16 May 61) OTS price $2.60

Hammond Metallurgical Lab., Yale U., New Haven, Conn.
SELF DIFFUSION OF LEAD-210 IN SINGLE CRYSTALS OF LEAD SELENIDE,
by Martin S. Seltzer and J. Bruce Wagner, Jr.
12 Apr 61. 17p. incl. illus. tables, 10 refs.
(Technical rept. no. 2)
(Contract Nonr-60934)
Unclassified report

DESCRIPTORS: *Lead, *Lead compounds, *Selenides, Single crystals, *Diffusion, *Semiconductors, Tracer studies, Radioactive isotopes, Crystal structure, Measurement, Chemical impurities, Bismuth compounds.

Self diffusion of Pb-210 in PbSe was studied in an inert atmosphere as a function of temperature (over the range 400-800 C) and defect concentration introduced by doping. Diffusion measurements were performed on specimens of p-type PbSe containing 10 to the 18th power holes/cc. and on specimens doped with 1/2 mol-% Bi2Se3 to give n-type material with 5 x 10 to the 19th power electrons/cc or 1/2 mol-% Ag2Se which resulted in p-type material containing 10 to the 19th power holes/cc. Doping with Bi2Se3 decreased diffusivities as compared with undoped PbSe whereas addition of Ag2Se caused diffusion coefficients to be increased. The diffusion activation energies were 0.83, 1.61, and 0.55 ev, for undoped PbSe, bismuth doped PbSe, and silver doped PbSe, respectively. The conclusion was made that Frenkel defects predominate in PbSe and that diffusion of Pb in this compound occurs predominantly by an interstitial mechanism under these conditions. (Author)

AD-256 020 Div. 25
(18 May 61) OTS price $4.60

Institute of Mathematical Sciences, New York U., N. Y.
SCATTERING FROM A PENETRABLE SPHERE AT HIGH FREQUENCIES,
by S. I. Rubinow. Dec 60, 139p. incl. illus. table, 23 refs. (Research rept. no. EM-163)
(Contract Nonr-25848)
Unclassified report

DESCRIPTORS: Analytical geometry, Spheres, *Diffraction, Scattering, Series, *Optics, Quantum mechanics, Integral equations, *Light, Mathematical analysis.

A scalar plane wave incident on a penetrable sphere is considered in the short wave length limit. A new representation of the scattering amplitude is introduced which is particularly appropriate in this limit, and which requires only the evaluation of certain integrals. Some of these may be evaluated asymptotically by the method of steepest descent and lead to the geometrical optics field contribution. Included in this is the bow field. The remainder of the integrals are evaluated by the method of residues and lead to the diffracted field contribution. This diffracted ray field is known from recent investigations in diffraction theory. An essential part of the analysis is the introduction of the parameter p, the number of internal refractions that a ray which hits the sphere undergoes. The results obtained are all in agreement with that which would be expected on the basis of geometrical diffraction theory. (Author)

AD-256 031 Div. 25, 4
(17 May 61) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
ORGANIC SEMICONDUCTORS. I. THE PHTHALOCYANINES.
by Charles John Hoffman. Technical rept. on Materials and Chemistry. Mar 61, 23p. incl. illus. tables, 46 refs. (Rept. no. LMSD-894817)
Unclassified report

DESCRIPTORS: Organic compounds, *Semiconductors, *Phthalocyanines, Chemical properties, Physical properties, Conductivity, Molecular structure, Polymers, Polymerization, Electrical conductance.

The chemistry and semiconducting properties of the phthalocyanines and the phthalocyanine polymers are reviewed. A brief introduction to the conduction mechanism occurring in organic semiconductors is given and the applications of this mechanism to the phthalocyanines are discussed. Experimental techniques for the measurement of the phthalocyanine conductivities have appreciably improved. The sample intercrystalline resistances have been reduced to a consistent minimum through the use of compacted specimens. Reproducible and consistent data have now been obtained which narrow the range of values to between 1.5 and 1.7 ev for the energy gap of the metal-free and the metal phthalocyanines. Advances in the chemistry of the polymeric phthalocyanines have been limited. Progress in this area has been impeded by the difficulties encountered in purification, analysis, and the determination of the degree of polymerization. Correlations of the energy gap size to the degree of polymerization of the phthalocyanines are, at best, approximations because of sample composition uncertainties. (Author)

AD-256 057 Div. 25, 2
(17 May 61) OTS price $10.10

Institute of Optics, U. of Rochester, N. Y.
REPORT ON CONFERENCE ON COHERENCE PROPERTIES OF ELECTROMAGNETIC RADIATION HELD AT THE UNIVERSITY OF ROCHESTER JUNE 27-JUNE 29, 1960.
Apr 61, 125p. incl. illus. (Technical note no. 5)
(Contract AF 49(638)602, Proj. 9768)
(AFOSR-583)
Unclassified report

DESCRIPTORS: *Symposia, *Light, *Coherent scattering, *Electromagnetic theory, *Electromagnetic waves, *Quantum mechanics, Correlation techniques, *Radio astronomy, Interferometers, Illumination, Optical images, Interference, Propagation, *Optics, *Light transmission, Theory.

Contents:
Basic experiments: Time coherence interferometry; Mixing of incoherent light
Properties of partially coherent fields: Coherence properties of light waves; A matrix treatment of partial coherence; Interference effects with incoherent light; Coherence properties of visible light propagation in dielectric waveguides
Coherent scattering: Optical modulation at hyperfine frequencies in alkali metal vapor; Interference effects in the resonance scattering from crossed atomic levels; Coherent scattering by mercury vapor
Stimulated emission: Phase as a dynamical variable in quantum mechanics; Quantum mechanical treatment of coupled cavity-molecular systems
Interferometric techniques in optics and in radio astronomy: Correlation techniques in radio astronomy and optics; The measurement of stellar diameters; Determining the illumination pattern of randomly illuminated apertures

Coherence problems of instrumental optics: Images of partially coherent objects; Theory of image formation in partially coherent illumination; Theory of interference and its applications to crystal optics; Coherence in two different kinds of two-beam or three-beam interference fields

AD-256 060 Div. 25, 9
(17 May 61) OTS price $8.10

Raytheon Mfg. Co., Waltham, Mass.
DISPERSION RELATIONS IN A STATIONARY PLASMA,
by B. S. Tanenbaum. Interim rept. no. 3. Jan 61, 81p. incl. illus.
(Contract AF 19(604)5984)
(AFCRL-43) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Plasma physics, Mathematical analysis, Equations, Oscillation, *Electromagnetic waves, Hydrodynamics, Magnetic fields.

Oscillations which are possible within a stationary, homogeneous, fully ionized, macroscopically neutral plasma of infinite extent are examined. In a field-free case, the dispersion relations for the longitudinal electron waves, the longitudinal ion waves, and the transverse electromagnetic waves are verified. For a longitudinal applied magnetic field, there are four dispersion relations, each representing a different type of plasma oscillation. Two of these are the same longitudinal electron and ion waves that are possible in the field-free case, and the remaining two are ordinary and extraordinary transverse waves which at high frequencies agree with the magneto-ionic theory of Appleton, at low frequencies agree with the magnetohydrodynamic theory of Alfven, and at intermediate frequencies have a form which does not agree with either of the earlier theories. With a transverse applied magnetic field, there are four solutions to the dispersion equation. One of these is the ordinary transverse wave of magneto-ionic theory, but the remaining three each represent complex coupled oscillations in the plane perpendicular to the applied field. After a great deal of analysis it is shown that one can arrange the solutions in a form such that one type of oscillation is identical to the extraordinary waves in magneto-ionic theory, another is quite similar to the longitudinal electron waves in the field free case, and the third coupled oscillation reduces to a longitudinal magnetohydrodynamic wave at low frequencies, an ordinary ionic wave at high frequencies, and a new type of wave at mid-frequencies. (Author)

AD-256 066 Div. 25, 22
(17 May 61) OTS price $2.60

Watervliet Arsenal, N. Y.
STRESSES IN A HYPERBOLICALLY NOTCHED PLATE,
by R. E. Weigle. Dec 60, 26p. incl. illus. tables
(Technical rept. no. WVT-RR-6018-R)
(Proj. 501-01-033)
Unclassified report

DESCRIPTORS: *Stresses, *Shear stresses, Mathematical analysis, Load distribution, Partial differential equations, Armor plate, Numerical analysis, Metal plates, Theory, *Elasticity.

The plane stress field in an infinite elastic plate bounded by the branches of a hyperbola is analyzed using the two-dimensional mathematical theory of elasticity. The equilibrium and compatibility equations of the mathematical theory of elasticity are formally satisfied by means of a biharmonic stress function. Lacking methods based on orthogonality, a method of successive approximations, utilizing stress function superposition techniques, is developed and used for obtaining the body stress distribution for prescribed boundary conditions. (Author)

AD-256 090 Div. 25, 2
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE BASIC CONCEPTS OF MAGNETO HYDRODYNAMICS,
by S. B. Pikel'ner. 9 Nov 60, 16p. incl. illus. 13 refs. (Trans. no. MCL-85 from Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, 1:46-53, 1958)
Unclassified report

DESCRIPTORS: Technological intelligence, *Magnetohydrodynamics, Magnetic fields, *Plasma physics, Astrophysics, Geophysics, Conductivity, Gas ionization, Electrons, Ions, USSR.

A short description is given of basic concepts of magneto hydrodynamics. Particularly emphasized is the influence of the movement of media on the magnetic field and the action of field on the media. (Author)

AD-256 097 Div. 25, 8
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PRESENT TRENDS IN THE DEVELOPMENT OF PHYSICS OF DIELECTRICS (Sovremennyye Napravleniya V Razvitii Fiziki Dielektrikov)
by G. I. Skanavi. 8 Nov 60, 10p. (Trans. no. MCL-253 from Vestnik Akademii Nauk SSSR, pp. 15-18, 1959)
Unclassified report

DESCRIPTORS: Dielectric properties, USSR, *Dielectrics, Electrets, Materials, *Solid state physics, Conductivity.

AD-256 108 Div. 25, 8
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONCERNING THE DEPTH OF PENETRATION OF MEDIUM-ENERGY IONS INTO A SUBSTANCE (O Glubine Proniknoveniya Ionov Srednikh Energiy V Veshchestvo),
by M. M. Bredov and N. M. Okuneva. 9 Nov 60, 3p. (Trans. no. MCL-345 from Doklady Akademii Nauk SSSR 113:795-796, 1957)
Unclassified report

DESCRIPTORS: Ions, Potassium, Cesium, Surface properties, Technological intelligence, Semiconducting films, *Semiconductors, USSR, Penetration, Germanium, *Diffusion.

Research concerns measuring the depth of penetration of cesium ions of 4 kiloelectron volts (Kev) energy into germanium. The labeled atom process was used for the purpose of determining the depth of penetration. The curves showing the relationship between the activity of the

irradiated samples and the time of etching, taken for a series of samples, in general had an analogous character for all the samples. On the average, the decrease of activity was such, that after one minute of etching, it comprised 66% of initial activity, after two minutes 56%, after three minutes 48%, after four minutes 40%, after five minutes 34%, and after six minutes 24%. (Author)

AD-256 116 Div. 25
(18 May 61) OTS price $7.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THEORY OF DIFFUSION IN ORDERING ALLOYS (Teoriya Diffuzii V Uporyadochivayushchikhsya Splavakh)
by M. A. Krivoglaz and A. A. Smirnov. 3 Nov 60, 76p. incl. illus. 50 refs. (Trans. no. MCL-559 from Teoriya Uporyadochivayuschchikhsya Splavov, pp. 203-256, 1958)
Unclassified report

DESCRIPTORS: *Alloys, *Diffusion, Theory, Crystal structure, Solid state physics, Lattices, Solids, USSR.

Contents:
General information on diffusion in alloys
Fundamentals of a phenomenological theory of diffusion in alloys
The theory of diffusion of interstitial atoms through the interstices
Diffusion of interstitial atoms in alloys with a body-centered cubic lattice
Diffusion of interstitial atoms in alloys with a face-centered cubic lattice structure
Determination of the equilibrium concentration of the vacancies on lattice sites of the alloy
The case of an alloy with body-centered cubic lattic structure
The case of an alloy with a face-centered cubic lattic structure
Self diffusion in alloys through the vacancy mechanism
The case of close energies of atomic interaction
The case of greatly differing energies of interaction of atoms
The effect of interstitial atoms on the self-diffusion of metal

AD-256 129 Div. 25, 17
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
PHYSICAL THEORIES CONCERNING THE STRENGTH OF SOLIDS, (Fizicheskiye Teorii Prochnosti Tverdykh Tel)(A SURVEY OF MODERN CONCEPTS)(Obzor Sovremennykh Predstavleniy)
by B. N. Narzullayev and L. G. Kalmykova. 4 Nov 60, 18p. incl. illus. 21 refs. (Trans. no. MCL-597 from Trudy Akademii Nauk Tadhikskoy SSR 54:103-114, 1956)
Unclassified report

DESCRIPTORS: *Solids, Mechanical properties, Physical properties, Theory, Failure (Mechanics), Stresses, Deformation, Rupture, Equations, Elasticity, *Solid state physics, Tensile properties, Alloys, Metals, USSR, Fracture (Mechanics).

AD-256 131 Div. 25, 17
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DETERMINATION OF MICROSTRESSES IN PLASTICALLY DEFORMED POLYCRYSTALLINE SOLIDS (k opredeleniyu mikronapryazheniy u plasticheski deformirovannykh polikristallicheskikh tel)
by B. Ya. Pines and N. G. Bereznyak. 4 Nov 60, 14p. incl. illus. (Trans. no. MCL-600 from Zhurnal Tekhnicheskoi Fiziki 24:329-336, 1954)
Unclassified report

DESCRIPTORS: Crystals, *Metallic crystals, *Tungsten, *Tantalum, *Deformation, Plasticity, Stresses, Analysis, Theory, X-ray spectroscopy, Lattices, Microstructure, Solids.

A method of harmonic analysis of the intensity distribution curve is used in determining the structural variations which arise during plastic deformation of polycrystalline samples of W and Ta. In order to refine the method for calculating the microdeformations, a relationship is established between the values of the coefficients of expansion into a Fourier series and the magnitude of the angle interval of the blurred (widening) line which has been assumed for the given analysis. It was found that after deformation the blurred lines on microphotographs are governed mainly by microstresses. The obtained microstress values are probably very close to the corresponding yield point values. Microdeformation is homogeneous only in the length intervals ranging from 1.0 to 1.5 x 10 to the -6th cm. The regions in which the microstresses are balanced and have linear dimensions of the same order of magnitude. (Author)

AD-256 137 Div. 25
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
INVESTIGATING THE ANISOTROPY OF THERMAL VIBRATIONS OF ATOMS IN CERTAIN METAL CARBIDES AND DIBORIDES OF TRANSIENT GROUPS WITH HEXAGONAL LATTICE (Izucheniye Anizotropii Teplovykh Kolebaniy Atomo v Nekotorykh Karbidakh i Diboridakh Metallov Perekhodnykh Grupp s Geksagonal'noy Reshetkoy)
by A. M. Belikov and Ya. S. Umanskiy. 4 Nov 60, 5p. (Trans. no. MCL-617 from Kristallografiya 4:684-686, 1959)
Unclassified report

DESCRIPTORS: *Carbides, *Borides, Crystals, Metallic compounds, Metallic crystals, Heat, *Lattices, Energy, Temperature, Atoms, Excitation, Chemical bonds, Vibration, USSR, Atomic structure, Molecular structure, Thermodynamics, Crystal structure.

Measurement of the thermal expansion coefficient (alpha) of the carbides and borides in the basic plane and perpendicular to it, and evaluation of the magnitude m(O squared) of the binding force of metallic atoms of carbides and diborides are discussed. The magnitude m(O squared) in the first approximation is proportional to the coefficient of quasi elastic force which returns the atoms into equilibrium position during thermal vibrations; m is the reduced mass of the atom and O the characteristic temperature of thermal vibrations. The displacement of interference maxima from the differently oriented crystallographic planes, and the weakening of their integral intensity during heating were used as a basis for calculating alpha values and characteristic temperatures along the axes.

AD-256 144 Div. 25, 17
(18 May 61) OTS price $1.10.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
A PROBLEM CONCERNING THE Ni3Cr COMPOUND,
by I. I. Kornilov and R. S. Mints. 7 Nov 60, 5p. (Trans. no. MCL-643 from Doklady Akademii Nauk SSSR 95:543-545, 1954)
Unclassified report

DESCRIPTORS: Nickel compounds, Solutions, Chromium compounds, *Nickel alloys, Solids, *Chromium alloys, Microstructure, Alloys, Resistance, Dilatometers, Phase studies, X ray diffraction analysis, Measurement, Temperature, Thermal expansion, USSR, Crystal structure, Intermetallic compounds.

Research was conducted on a solid Ni solution of the Ni-Cr system by microstructural analysis, electric resistance, dilatometry, and X-ray and phase analysis methods. The structure of all examined alloys after hardening and etching represented a homogenous solid Ni solution in which an increase in Cr content increased the hardness and electrical resistance. All the alloys except one with 35 at-% Cr fell into an area of a solid Ni solution at all temperatures. The composition diagram indicated an increased drop in electric resistance of alloys of 20 to 30 at-% Cr in proportion to time. A decrease in electric resistance of alloys was also noted in the interval of conversion temperature.

AD-256 153 Div. 25, 17
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE STRUCTURE AND PHASE COMPOSITION OF DIFFUSION COATING OF NIOBIUM BY SILICON.
by P. M. Arzhanyy, R. M. Volkova, and D. A. Prokoshkin. 7 Nov 60, 9p. incl. table (Trans. no. MCL-676 from Izvestiya Akademii Nauk SSSR. Otdeleniye Tekhnicheskikh Nauk. Metallurgiya i Toplivo 6:127-129, 1959)
Unclassified report

DESCRIPTORS: *Niobium, Microstructure, Crystal structure, Phase studies, *Silicon coatings, Diffusion, Metallurgical analysis, X-ray diffraction analysis, Industrial radiography, Hardness, *Niobium alloys, *Silicon alloys, USSR, Coatings.

AD-256 166 Div. 25
(17 May 61) OTS price $2.60

Northwestern Technological Inst., Evanston, Ill.
YIELD POINTS IN ALPHA-CU-AL SINGLE CRYSTALS,
by T. J. Koppenaal and M. E. Fine. 12 Apr 61, 20p. incl. illus. table, 26 refs. (Technical rept. no. 3)
(Contract Nonr-122811, Proj. 031-618)
Unclassified report

DESCRIPTORS: *Crystals, *Metallic crystals, *Single crystals, Copper alloys, Aluminum alloys, Lattices, Deformation, Stresses, Plasticity, Measurement, Test equipment, Test methods, Temperature, Aging, Heat treatment, Specific heat, Thermodynamics, X-ray absorption analysis, Mechanical properties, Theory.

A yield point effect attributed to short-range ordering (SRO) occurs in Cu base Al. The yield drop at 296 K varies with heat treatment, decreasing as the annealing temperature is raised from 433 to 598 K. Yield drop (523 K anneal, measured at 77 K) is approximately proportional to (c sub Al (1-c sub Al)) squared, where c is the atomic concentration of the solute. The variation of yield drop with strain rate and testing temperature is also consistent with the idea that it is associated with SRO. (Author)

AD-256 216 Div. 25
(22 May 61) OTS price $6.60

Plasmadyne Corp., Santa Ana, Calif.
IONIZATION IN AN ELECTRODELESS DISCHARGE,
by Richard P. Treat. 15 Mar 61, 62p. incl. illus. (Rept. no. TN-031-655)
(Contract AF 49(638)655, Proj. 9751)
(AFOSR-473) Unclassified report

DESCRIPTORS: *Ionization, Hydrogen, Magnetic fields, *Magnetohydrodynamics, Plasma physics, *Gas ionization, Discharge tubes, Mathematical analysis, Electromagnetic fields, Gas discharges, Partial differential equations, Electric fields, Magnetic fields, Electrons, Density, Electric discharges.

An analytical study was made of the ionization occurring in a weakly pre-ionized molecular hydrogen gas. The configuration studied consists of a long cylindrical gas column subjected to a strong, fast rising axial magnetic field which is initially zero. The investigation shows that in practice it is possible to obtain a large number of ionization collisions in a time t sub m during which the plasma mass motion and the magnetic field are negligible. For this time interval, if electron losses are neglected, the increase in ionization fraction depends only on the voltage induced around the discharge tube and on the ratio of the circumference of the tube to the electron mean free path. Quantitative order of magnitude results are given for this relation. For a fixed voltage around the discharge tube, maximum ionization during the mass motion time t sub m occurs if the energy gained by an electron in a free path is about equal to the threshold energy for ionization. (Author)

AD-256 230 Div. 25, 15
(18 May 61) OTS price $1.60

Metals Research Lab., Carnegie Inst. of Tech., Pittsburgh, Pa.
ANALYSIS OF CRYSTAL FACETING AS A LINEAR PROGRAMMING PROBLEM,
by W. W. Mullins and R. F Sekerka. 1961, 9p. illus.
(Contract DA 36-034-ORD-2794, Proj. TB2-0001)
(OOR rept. no. 2320:5) Unclassified report

DESCRIPTORS: *Crystals, Crystal structure, Surface properties, Energy, *Linear programming, Measure theory.

The principal purpose of this paper is to present a geometrical construction that yields the minimum free energy a planar crystal surface may achieve by faceting, that is, by breaking up into orientations other than the one originally present. A comparison of this problem with the well known one of predicting the equilibrium shape of a crystal shows that both require the minimization of the surface free energy but that the constraints differ; in the equilibrium shape problem the volume of material is constant; in the present faceting problem the average orientation of the surface remains constant and equal to that of the original plane. The Wulff construction solves

the equilibrium shape problem; it will be shown to also determine the solution of the faceting problem. The work represents an extension of certain results due to Herring who has given a construction which yields the free energy of a surface faceted in a specified mode, but has not considered the minimum problem. (Author)

AD-256 244 Div. 25
(19 May 61) OTS price $1.10

California U., La Jolla.
CYCLOTRON RESONANCE AND DE HAAS-VAN ALPHEN OSCILLATIONS OF AN INTERACTING ELECTRON GAS,
by Walter Kohn. 1961. 10p. (Technical rept. no. 6)
(Contract Nonr-221611, Proj. NR 017-630)
Unclassified report

DESCRIPTORS: Oscillations, Gases, *Electrons, Metals, Cyclotrons, Resonance, Magnetic fields, Atomic energy levels, Excitation, *Perturbation theory, Mathematical analysis, Theory, Atomic structure, Solid state physics, *Magnetic susceptibility, Conductivity, Energy.

An electron gas with short range interactions is considered in the presence of a uniform magnetic field. It is shown that: (1) The cyclotron resonance frequency is independent of the interaction; (2) For a two-dimensional gas, the De Haas-Van Alphen period is independent of the interaction. The low-lying excited states are briefly discussed. (Author)

AD-256 262 Div. 25, 17
(19 May 61) OTS price $2.60

Honeywell Research Center, Hopkins, Minn.
RESEARCH ON PROPERTIES OF CLEAN SURFACES,
by S. R. Morrison, D. R. Palmer, and C. E. Dauenbaugh. Final rept. May 61, 24p. incl. illus. 27 refs.
(Contract AF 49(638)597)
Unclassified report

DESCRIPTORS: *Semiconductors, *Surface properties, Adsorption, Oxidation, Electrical properties, *Surfaces, Silicon, Measurement, Germanium, Indium compounds, Antimonides, Intermetallic compounds, Oxygen.

Experiments to determine the surface band structure of clean surfaces produced by cleavage in ultra-high vacuum have been performed on germanium, silicon, and indium antimonide. A clean Ge surface is highly p-type with the Fermi level at the surface near the valence band. This is brought about by acceptor-like surface states in the valence band with a density of 2 to 3 x 10 to the 12th power/sq cm. The density of these low-lying surface states decreases when the surface is exposed to oxygen. A clean Si surface is nearly intrinsic, possibly slightly n-type, indicating that the dominant surface states near the center of the forbidden gap at the surface. Preliminary results on InSb are reported. (Author)

AD-256 267 Div. 25, 17
(19 May 61) OTS price $3.60

Lincoln Lab., Mass Inst. of Tech., Lexington.
SEMI-METALS. A NEW HORIZON,
by Benjamin Lax. 24 Apr 61. 19p. illus. 12 refs.
(Rept. no. 8G-0012)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: *Metals, Electrical properties, Semiconductors, *Electrical conductance, Alloys, *Electron transitions, Atomic energy levels, Magnetic fields, Diodes, Infrared radiation, Transmission, Bismuth, Lattices, Crystal structure, Reflection, Theory, Infrared spectroscopy, Bismuth alloys, Antimony alloys.

A study was made of the electrical properties of semi-metals (metals in which the conduction process is carried on simultaneously by both holes and electrons and in which the number of current carriers is a small but a finite fraction per atom). The increase in IR transmission by Bi at 40 microns is hypothesized as being a transition from the valance band located at the center of the zone of conduction band at the edge of the Brillouin zone, or conversely, all at the Fermi surface, in which a phonon of approximately 0.03 ev is emitted. Magnetic oscillation effects at energies less than the direct gap are interpreted to be based on the indirect transition between the valence and conduction bands. The possibilities of semi-metal diodes and tunnel diodes made of Bi-Sb alloys are discussed. The conclusion is made that both optical and electrical methods involving the use of high magnetic fields recently developed for semiconductors, can be extended to semi-metals.

AD-256 268 Div. 25, 17
(19 May 61) OTS price $1.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
ON THE MIDSURFACE STRAIN-DISPLACEMENT RELATIONS IN THIN-SHELL BUCKLING AND LARGE-DEFLECTION ANALYSIS,
by D. O. Brush and B. O. Almroth. Technical memo. on Flight Sciences. Apr 61, 13p. (Rept. no. LMSD-894818)
Unclassified report

DESCRIPTORS: *Structural shells, Stresses, Buckling, Deformation, Equations, Geometry, Configuration, Mathematical analysis, Nonlinear systems, Theory, Guided missiles, Space probes, Cylindrical bodies, Spaceships, Mechanical properties, *Deflection.

A set of approximate, nonlinear, midsurface strain-displacement relations has been presented for thin structural shells. The equations were derived in terms of specific geometrical limitations on the shell deformation. Both the specification of the limitations and the method of development of the equations are due to Novozhilov (Foundations of the Nonlinear Theory of Elasticity, Rochester, N. Y., Graylock, 1953). The midsurface strain-displacement relations presented are the counterpart in orthogonal curvilinear coordinates of the corresponding von Karman flat-plate relations in Cartesian coordinates. The equations contain quadratic terms in u and v as well as in w. The influence of the nonlinear terms in the tangential displacement components was examined in an infinitesimal-buckling analysis of a circular ring subjected to uniform external pressure. As expected, it was found that omission of quadratic terms containing v in the mid-surface strain-displacement relations substantially alters the calculated buckling pressure for the buckling mode in which n equals 2. (Author)

AD-256 272 Div. 25, 13
(19 May 61) OTS price $2.60

Illinois Inst. of Tech., Chicago.
INTERACTION CURVES FOR CIRCULAR CYLINDRICAL

SHELLS ACCORDING TO THE MISES OR TRESCA YIELD CRITERION,
by Philip G. Hodge, Jr., and Joseph Panarelli.
Feb 61, 19p. illus. (DOMIIT rept. no. 1-12)
(Contract Nonr-140604, Proj. NR 164-429)
Unclassified report

DESCRIPTORS: Cylindrical bodies, *Structural shells, *Stresses, Mathematical analysis, Tensile properties, *Mechanical properties, Plastics, *Plasticity, Load distribution.

A circular cylindrical shell clamped at both ends, supporting an internal pressure P and an axial load T is treated. The relation between P and T at which the rigid/perfectly plastic shell can undergo a small, quasi-static deformation while remaining in equilibrium is investigated. The treatment used may be extended to shells with different end conditions. The basic theory as well as the yield surfaces, exact and approximate are discussed. Some complete and partial solutions are given for two linear yield conditions. Ways to obtain good bounds on the solutions for shells whose material obeys the Tresca and Mises yield conditions respectively are given. (Author)

AD-256 273 Div. 25
(19 May 61) OTS price $2.60

Radiation Lab., Johns Hopkins U., Baltimore, Md.
CRYSTAL SPLITTING OF SYMMETRIC TOP ROTATIONAL LEVELS,
by R. L. Armstrong. May 61. 20p. incl. tables, 16 refs. (Technical rept. no. WR-AF-1)
(Contract AF 33(616)6457)
Unclassified report

DESCRIPTORS: Functions, *Crystals, Nitrogen, Low temperature research, *Lattices, Rotation, Molecular rotation, Dipole moments, Mathematical analysis, *Crystal structure, Quantum mechanics.

A study is made of the rotational states of an XY3 non-planar symmetric top molecule trapped in a nitrogen lattice at low temperatures. Symmetry considerations and group theoretical techniques are indicated as eliciting general features of the problem. Rotational level splittings are calculated under the assumption of dipole-quadrupole forces. It is found that the crystalline field strongly mixes those rotational states populated at the temperatures considered. (Author)

AD-256 282 Div. 25
(19 May 61) OTS price $1.60

Massachusetts Inst. of Tech., Cambridge.
MAGNETIC FIELD INTERACTIONS WITH A MOVING METAL SLUG,
by Don Joel Wilen. May 61, 16p. incl. illus.
(Proj. Squid TR no. MIT-24-R; Contract Nonr-185825, Proj. NR-098-038)
Unclassified report

DESCRIPTORS: *Plasma physics, *Magnetic fields, Solenoids, Metals, Cylindrical bodies, Reynolds number, *Conductivity, Magnetism.

The interactions are treated of a cylindrical metal slug falling through an axially symmetrical magnetic field created by a solenoidal coil. The parameters considered are: change in flux of the magnetic field measured by voltage changes across search coils, and change in kinetic energy of the falling slug due to coil interactions obtained by measuring changes in slug velocity. Measurements were made by dropping metal slugs through coils of different aspect ratios. Flux changes were found to be linear with respect to magnetic Reynolds number in the region measured (Rm between 1 and 14). (Author)

AD-256 306 Div. 25, 20
(19 May 61) OTS price $8.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
CENTRIFUGAL STRETCHING IN SYMMETRIC-TOP MOLECULES AND THE STARK EFFECT OF CHLOROTRIFLUOROMETHANE,
by R. C. Johnson. Doctoral thesis. 2 May 61, 96p. incl. illus. tables, 36 refs. (Technical rept. no. 3)
(Contract Nonr-99107, Proj. A-390)
Unclassified report

DESCRIPTORS: *Molecules, *Methanes, Chlorides, Fluorides, *Electron transitions, Molecular structure, *Dipole moments, Measurement, Electric fields, Hyperfine structure, Atomic spectrum, Molecular spectroscopy, Quadrupole moments, Microwave spectroscopy, Quantum mechanics, Molecular rotation, Centrifugal fields, Mathematical analysis.

Detailed calculations of distortion constants, D sub JJ and D sub JK, were made for three molecules: (1) CH3Cl, a typical methyl halide; (2) CCl F3, a molecule with bonding similar to that of CCl3F; and (3) CHF3, a molecule with its center of mass within the CF3 tetrahedron. All three were found to obey existing distortion theory within the limits of experimental error. Theoretical distortion constants can be calculated from the molecular structure and the molecular force constants. A comparison of measured and theoretical constants for 9 symmetric-top molecules shows reasonable agreement for all except CCl3F and CHCl3, which are the only molecules considered having three identical nuclei with quadrupole moments. From Stark effect measurements on the J equals 1 to 2 transition, the molecular dipole moment of C-12 Cl-35F3 was assigned the value 0.50 + or -0.01 debye. (Author)

AD-256 340 Div. 25, 8, 20
(22 May 61) OTS price $1.60

Battelle Memorial Inst., Columbus, Ohio.
THEORETICAL AND EXPERIMENTAL STUDIES CONCERNING RADIATION DAMAGE IN SELECTED COMPOUND SEMICONDUCTORS,
by L. W. Aukerman, E. M. Baroody, and R. D. Graft. Interim progress rept. no. 1, 1 Feb-15 May 61. 15 May 61, 16p. incl. illus.
(Contract AF 33(616)8064)
Unclassified report

DESCRIPTORS: *Semiconductors, Gallium compounds, Arsenic compounds, Arsenides, Neutron bombardment, Electron bombardment, *Radiation damage, Heat treatment, Solids, Temperature, Conductivity, Theory.

Anomalously low mobilities produced in n-type GaAs as a result of fast-neutron irradiation are interpreted in terms of inhomogenities in the carrier concentration. The very steep temperature dependence of mobility is still a puzzling feature of these irradiations. Annealing of electron-irradiated n-type GaAs can be analyzed in terms of two first-order processes. The first process appears to be independent of the extrinsic

properties of the sample. The second process is correlated with the major impurity content or the carrier density. Activation energies for the two processes are respectively, 1.1 + or - 0.08 ev and 1.7 + or - 0.2 ev. (Author)

AD-256 403 Div. 25, 4
(22 May 61) OTS price $1.60

Pennsylvania State U. Mineral Industries Experimental Station, University Park.
CRYSTAL CHEMISTRY STUDIES,
by Rustum Roy, Y. Ukai, and R. Datta. Quarterly progress rept. no. 5, 1 Jan-31 Mar 61. 20 Apr 61, 3p.
(Contract DA 36-039-sc-85311)
Unclassified report

DESCRIPTORS: Ferromagnetic materials, *Spinels, *Ferroelectric materials, Crystals Piezoelectric crystals, *Ferroelectric crystals, Dielectric properties, Lattices, Crystal structure, Temperature, Solubility, Phase studies, Nickel compounds, Oxides, Titanium compounds, Zinc compounds, Cobalt compounds, Germanium compounds, Infrared spectroscopy, Spectrographic analysis.

This report includes:
ON THE TEMPERATURE DEPENDENCE OF THE CATION DISTRIBUTION IN OXIDE SPINELS, by Ranajit K. Datta and Rustum Roy. 21 Apr 61, 5p. incl. illus.
(Technical rept. no. 2)
(Contract DA 36-039-sc-85311)

In the spinel work, attempts are in process to program one of the local computers to calculate the expected X-ray intensities for a given distribution of given cations. Further work on solid solubility between silicate and aluminate spinels has been started. The final experimental work on the fluorite and spinel solid solutions is complete and much of the dielectric constant and loss measurement is complete. (Author)

AD-256 443 Div. 25
(22 May 61) OTS price $5.60

Watervliet Arsenal, N. Y.
THERMAL STRESSES IN SPHERICAL SHELLS,
by M. A. Sadowsky. Nov 60, 55p. incl. tables.
(Technical rept. WVT RR 6016 R)
(DA Proj. 599-01-004, OOR Proj. 1-294)
Unclassified report

DESCRIPTORS: *Elastic shells, Structures, Stresses, Elasticity, Mechanical properties, Membranes, Heating, Temperature, Spheres, *Thermal stresses, Deformation, Theory, Mathematical analysis, Fourier analysis, Solid state physics, Functional analysis, Thickness.

It is shown that a stationary temperature field in a thick elastic spherical shell can be represented by a Fourier Series. The individual terms of this series are associated with displacement fields and stress fields which have been explicitly determined by the method of thermo-elastic potential solutions and by Bossinesq displacement potential solutions. The resulting coefficients of superposition are tabulated. With the general thick shell solution thus available, two specializations are analyzed: (1) membrane shells, expanding radially without any stress appearing whatsoever due to heating; and (2) shells of thickness h with perceptible bending movement formation, for which the stresses have been explicitly determined. (Author)

AD-256 456 Div. 25
(24 May 61) OTS price $2.60

Institute of Air Flight Structures, Columbia U., New York.
ON THE CONDUCTION OF HEAT IN A MELTING SLAB,
by Stephen J. Citron. Mar 61, 15p. illus. (Technical rept. no. 18; CU-18-61-ONR-26620-CE)
(Contract Nonr-26620, Proj. NR 064-401)
Unclassified report

DESCRIPTORS: *Conductivity, *Heat transfer, Differential equations, Mathematical analysis, Temperature, Melting, Solids, Surfaces, Measurement, Structures, Theory.

A new method for the solution of the problem of heat conduction in a melting slab, where the molten material is immediately removed upon formation, is presented. No restrictions are placed on the boundary conditions which may be imposed on the slab and the material properties are allowed to be temperature dependent. The problem of determining the temperature distribution in the slab and the amount of material melted is reduced to finding the solution of an ordinary differential equation on the amount of material melted. This reduction from a partial differential equation problem is accomplished by determining a Taylor's series expansion in space for the temperature distribution. The equation so obtained for the determination of the amount of material melted is of a form readily solved numerically. Comparisons with known results for a slab insulated on one face and subjected to a constant heat input on the other face are given. (Author)

AD-256 457 Div. 25
(24 May 61) OTS price $5.60

Institute of Air Flight Structures, Columbia U., New York.
TRANSIENT COUPLED THERMOPLASTIC BOUNDARY VALUE PROBLEMS IN THE HALF-SPACE,
by Bruno A. Boley and Irwin S. Tolins. Apr 61, 55p. incl. illus. tables. (Technical rept. no. 19; CU-19-61-ONR-26620-CE)
(Contract Nonr-26620, Proj. NR 064-401)
Unclassified report

DESCRIPTORS: *Thermal stresses, *Plasticity, Thermal diffusion, Temperature, Integral transforms, Determination, Propagation, Integrals, *Elasticity, Heat transfer, Thermodynamics.

The propagation of mechanical and thermal disturbances in a half-space is studied by means of the solution of some transient boundary-value problems according to the coupled thermoelastic theory. The problems considered are those of a half-space under step time-variations of strain, temperature or stress uniformly distributed over the free surface. The coupled solution of Danilovskaya's problem is thus included. The solution is obtained by the use of Fourier sine transforms, and the behaviors at short and long times, as well as the propagation of discontinuities, are studied. The principal differences between the present results and analogous ones derived by neglecting thermoelastic coupling are found to be: (1) mechanical discontinuities are not propagated unchanged in magnitude, but decrease exponentially with time because of the effect of thermoelastic damping (though the speed of their propagation is unaltered), (2) mechanical responses occur instantaneously at all points of

the body (but are very small at large distances from the free surface), and (3) the temperature distribution is still continuous but exhibits jumps either in its first or second derivative. (Author)

AD-256 458 Div. 25, 15
(23 May 61) OTS price $14.50

North Carolina State Coll., Raleigh.
CRACK PROBLEMS IN THE MATHEMATICAL THEORY OF ELASTICITY,
by I. N. Sneddon. 15 May 61, 215p. incl. illus. tables, 210 refs. (Rept. no. ERD-126-1)
(Contract Nonr-48606)
Unclassified report

DESCRIPTORS: *Elasticity, Theory, *Solids, *Stresses, Crystals, Fracture (Mechanics), *Mathematical analysis, Bibliography.

The topic of main interest is the calculation of the stress field in the vicinity of a crack (or cracks) in a homogeneous isotropic solid. The principal methods available for the solution of such problems are treated. Problems in aelotropic bodies are not considered, nor are the physical implications of the results of the calculations. (Author)

AD-256 479 Div. 25, 14, 17
(24 May 61) OTS price $2.75

Defense Metals Information Center, Columbus, Ohio.
THE EMITTANCE OF COATED MATERIALS SUITABLE FOR ELEVATED-TEMPERATURE USE,
by W. D. Wood, H. W. Deem, and C. F. Lucks.
4 May 61, 136p. incl. illus. tables (DMIC memo. no. 103)
Unclassified report

DESCRIPTORS: *Heat transfer, *Thermal radiation, *Metals, Thermodynamics, Paints, *Coatings, *Ceramic coatings, Borides, Carbides, Enamel coatings, Oxides, Silicides.

Contents (Data taken from literature from 1940 through 1960):
Boride coatings
Carbide coatings
Enamels and paints
Oxide coatings
Silicide coatings
Miscellaneous coatings

AD-256 481 Div. 25
(23 May 61) OTS price $1.60

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
MOBILITY AND CLUSTERING OF NEGATIVE IONS AND MASS-SPECTROGRAPHIC STUDY OF ION-MOLECULE REACTIONS OCCURRING AT THERMAL ENERGIES UNDER GAS KINETIC CONDITIONS,
by E. W. McDaniel and D. W. Martin. Final summary rept. 1 Aug 55-31 Mar 61. 31 Mar 61, 11p.
(Technical status rept. no. 23)
(Contract AF 18(600)1524, Proj. A-251)
Unclassified report

DESCRIPTORS: *Ions, Ionization, Molecules, *Gas ionization, Plasma physics, Diffusion, Instrumentation, *Transport properties, Helium, Lithium, Hydrogen, Mass spectroscopy.

Work concerned the following phases of investigation: mobility and clustering of negative ions, ionization, plasmas, mass spectrographic study of ion-molecule reactions. The following subjects are discussed: the motivation for the experimental work, the experimental detectors, method (ion source, ion loss mechanism, detectors, ion extraction), and observations and results.

AD-256 489 Div. 25
(23 May 61) OTS price $1.10

Illinois U., Urbana.
COMPRESSIBLE LAMINAR MOTION WITH FLUCTUATION IN FREE STREAM TEMPERATURE,
by S. L. Soo. May 61, 6p.
(Proj. Squid TR no. ILL-1-P; Contract Nonr-185825, Proj. NR-098-038)
Unclassified report

DESCRIPTORS: *Thermodynamics, *Gas flow, Fluid mechanics, Heat transfer, Metal plates, Laminar boundary layer, Compressible flow, Friction.

Momentum and heat transfer from a wall moving in a fluid of varying temperature are studied. The simple case of two-dimensional impulse motion of an infinite flat plate in a semi-infinite compressible medium of fluctuating temperature is considered. The temperature of the flat plate is kept constant. The aim is to develop some understanding of this type of problem and to determine the effect of such fluctuation on friction and heat transfer of laminar motion. (Author)

AD-256 495 Div. 25, 15
(23 May 61) OTS price $7.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
NONLINEAR SYSTEMS WITH GAUSSIAN INPUTS,
by David A. Chesler. Doctoral thesis. 15 Feb 60, 76p. incl. illus. table. (Technical rept. no. 366)
(Contract DA 36-039-sc-78108, Proj. 3-99-00-000)
Unclassified report

DESCRIPTORS: *Electrical networks, Theory, Nonlinear systems, Special functions, Noise, Integral equations, Statistical functions.

Methods are developed for optimizing a general multi-input, single-output, nonlinear system whose inputs are Gaussian processes. The output of the nonlinear system is expressed as a sum of orthogonal functional polynomials of the inputs. The only statistical information needed for this optimization is composed of the first-order autocorrelations and crosscorrelations among the inputs, and the higher-order corsscorrelations between the inputs and the desired output. Methods are developed also for optimizing simple single-input nonlinear systems whose input is Gaussian. The systems consist of combinations of linear systems and nonlinear no-memory devices. The systems have a fixed form with some undetermined parameters. The system is optimized by making an optimum choice of the values of these parameters. Methods are presented for determining these optimum values by measurements. (Author)

AD-256 499 Div. 25
(24 May 61) OTS price $1.60

Mellon Inst. of Industrial Research, Pittsburgh, Pa.
THE INFRARED SPECTRA OF THICK FILMS OF CO2 AND

CO2 + H2O AT LOW TEMPERATURES,
by Marilyn E. Jacox and Dolphus E. Milligan.
1 May 61, 14p. incl. illus. tables.
(Contract AF 49(638)542)
(AFOSR-685) Unclassified report

DESCRIPTORS: *Carbon dioxide, *Water, Films, *Infrared spectroscopy, Low temperature research, Lattices, Crystals, Absorption, Crystal structure, Complex compounds.

High resolution infrared absorption studies on thick films of CO2 and of dilute solid solutions of H2O in CO2 have been made at 53 and 4 K. A spectroscopically observable complex between CO2 and H2O is not formed. The isolation of H2O in the CO2 matrix at 53 K is quite good. Monomer and dimer absorptions have been assigned in the 1/1600 to 1/1650 cm region. In very thick films of pure CO2 nu(1) appears, weakly, at 53 K. In samples deposited at 4 K the nu(1) absorption is markedly intensified, probably because of an increased number of crystal imperfections, and 2nu(2) is also observed. Similar systems of lattice vibrations have been observed in combination with both nu(2) and nu(3). (Author)

AD-256 512 Div. 25
(25 May 61) OTS price $5.60

North Carolina State Coll., Raleigh.
GASES AS SECONDARY HEAT TRANSFER FLUIDS,
by J. S. Doolittle, W. O. Doggett and C. F. Martin. Oct 60, 48p. incl. illus. tables.
(Contract Nonr-48603)
Unclassified report

DESCRIPTORS: *Gases, *Heat transfer, *Hydrogen, Heat exchangers, Pipes, Alkali metals, Liquid metals.

Alkali liquid metals, because of their superior heat transfer characteristics, rate highly as secondary heat transfer fluids for systems consisting of a high temperature secondary heat exchanger, a transfer piping system, and one or more air radiators. However, because alkali liquid metals are highly corrosive when even very small amounts of impurities are present, consideration is given to the relative merits of gases. The relative effect of the use of hydrogen rather than an alkali liquid metal is presented for the secondary heat exchanger, the transfer piping, and the air radiator. In general, by a change in the configuration of the component parts, it is possible when using hydrogen to reduce weights to values comparable with those required for the liquid alkali metals. However, gas pressures must be in the order of several thousand pounds per square inch and pumping powers used which are several times those for the liquid alkali metals. Similarly, by using larger parts whose weights are several times those required for the alkali liquid metals, the pumping horsepowers may be reduced to values similar to those for the liquid alkali metals. (Author)

AD-256 528 Div. 25
(23 May 61) OTS price $1.10

University of Southern Calif. Engineering Center, Los Angeles.
DIFFUSION OF A FULLY IONIZED GAS CONFINED IN A STRONG MAGNETIC FIELD,
by Toyoki Koga. 12 Apr 61, 4p. (USCEC rept. no. 56-209; Suppl. 1 to USCEC rept. no. 56-209, AD-231 047)
(Contract AF 18(603)95)
(AFOSR TN 59-1162, Suppl. 1)
Unclassified report

DESCRIPTORS: *Gas ionization, *Diffusion, Magnetic fields, *Plasma physics, Particles, Mathematical analysis.

AD-256 549 Div. 25, 1, 12, 13
(24 May 61) OTS price $3.60

Massachusetts Inst. of Tech., Cambridge.
RANDOM VIBRATION OF BEAMS,
by Stephen H. Crandall and Asim Yildiz. Apr 61, 31p. illus. tables.
(Contract AF 49(638)564)
(AFOSR-484) Unclassified report

DESCRIPTORS: *Beams, *Vibration, Damping, Stresses, Mathematical analysis, Motion, Load distribution, *Mechanics, *Dynamics.

The mean square deflections, slopes, bending moments and shear forces were compared for 4 different dynamical models with 3 different damping mechanisms, subjected to a distributed transverse loading process which was uncorrelated space-wise and which was either ideally, white time-wise or band-limited with an upper cut-off frequency. The dynamic models were the Bernoulli-Euler beam, the Timoshenko beam and two intermediate models, the Rayleigh beam, and a beam which has the shear flexibility of the Timoshenko beam but not the rotatory inertia. The damping mechanisms were transverse viscous damping, rotatory viscous damping, and Voigt visco-elasticity. Many of the mean square response quantities were finite when the excitation was ideally white (i.e., when the input has infinite mean square), however some of the responses were unbounded. For these cases the rate of growth of the response was obtained as the cut-off frequency of the excitation was increased. (Author)

AD-256 588 Div. 25
(25 May 61) OTS price $3.60

Hughes Research Labs., Malibu, Calif.
MAGNETOHYDRODYNAMIC WAVES IN THE IONOSPHERE,
by H. H. C. Chang. 31 Jan 61, 29p. incl. illus. table. (Scientific rept. no. 1)
(Contract AF 19(604)7372)
(AFCRL-64) Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Ionosphere, *Electromagnetic waves, Low frequency, Propagation, Reflection, Transmission, Plasma physics, Velocity.

The ten conditions which must be satisfied before simple magnetohydrodynamic (MHD) waves can propagate in a plasma are enumerated and discussed. Assuming that all but the tenth condition are satisfied throughout the ionosphere and that the earth is a perfectly conducting plane, the propagation of MHD waves in a horizontally stratified ionosphere composed of electrons, ions, and neutrals is studied when an arbitrarily oriented plane wave is obliquely incident at the lower edge of the ionosphere. The equations governing the behavior of the field quantities are cast in the coupled form suitable for computation by means of a high-speed modern computer, but no numerical results are obtained because of the prohibitive amount of work necessary to solve the equations in the case of oblique incidence. The velocity of MHD waves is formulated. (Author)

AD-256 598 Div. 25, 8, 30
(25 May 61) OTS price $8.10

David Sarnoff Research Center, Princeton, N. J.
NEGATIVE MASS CARRIER PHENOMENA BY CYCLOTRON RESONANCE TECHNIQUES,
by G. C. Dousmanis, R. C. Duncan, Jr., and B. W. Faughnan. Final rept. 15 Mar 61, 79p. incl. illus.
(Contract AF 19(604)5479)
(AFCRL-152) Unclassified report

DESCRIPTORS: Resonance absorption, Low temperature research, *Germanium, *Electron transitions, Resonance, *Microwaves, Polarization, Cyclotrons, Radiofrequency spectrum analyzers, *Spectrographic analysis, *Crystals, Measurement, *Microwave spectroscopy, Mathematical analysis, *Radiofrequency power, Silicon, Cavity resonators, Waveguides, Dielectrics.

An emissive cyclotron resonance, arising under optical excitation from the negative-mass branch of heavy holes in Ge, was established and extensively studied by use of circularly polarized microwaves. The effective mass is -(0.26 + or - 0.06) mo as expected from the band-structure determined by Lincoln Laboratories. Efforts to enhance the emission, although not exhausted, still leave the effect submarginal for useful amplification by more than an order of magnitude. The properties of Landau levels for negative masses were delineated and their relevance to emission is discussed. The work allows evaluation of various proposals for uses of negative-mass carrier phenomena. Another resonance (absorptive) was found with m equals (0.032 + or - 0.007) mo and may arise from that part of the light holes (near (100) axis) that corresponds to the negative-mass region of heavy holes. The importance of these novel effects for future work is emphasized. (Author)

AD-256 614 Div. 25
(26 May 61) OTS price $9.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SOME THEORIES OF VIBRATIONS WITH SELF-DAMPING AND THEIR EVALUATION FROM THE POINT OF VIEW OF EXPERIMENTAL DATA,
by Sergey Yevgen'yevich Dmitriyevskiy.
21 Nov 60, 118p. incl. illus. (Trans. no. MCL-684 from Nekotoryye Teorii Kolebaniy S Sobstvennym Zatukhaniyem i Ikh Otsenka s Tochki Zreniya Opytnykh Dannykh, pp 1-85, Moscow, 1957)
Unclassified report

DESCRIPTORS: Vibration, Damping, *Dynamics, Experimental data, Theory, *Deformation, *Elasticity, USSR.

The different dependences of vibration damping on the internal resistance in the material is examined. It is customary to call such vibrations vibrations of elastic bodies with self-damping. A new theory is proposed in which vibration damping is considered as a function of both velocity and displacement. The theory also considers damping as being proportional to the second degree polynomial of deformation. (Author)

AD-256 616 Div. 25, 20
(26 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HEAT TRANSFER INTO A SINGLE PIPE IN THE TRANSVERSE CURRENT OF A LIQUID WITH LOW PRANDTL NUMBER,
by A. A. Andreyevskiy. 5 Dec 60, 10p. incl. illus. table (Trans. no. MCL-753 from Inzhernо Fizicheskiy Zhurnal, pp. 46-51)
Unclassified report

DESCRIPTORS: *Heat transfer, Pipes, Heat exchangers, *Liquid metals, Liquid cooled, Liquid metal cooled reactors, Cylindrical bodies, Fluid flow.

The paper presents results of investigation into the heat transfer of a single pipe with the diameter of 22 mm in the ambient flow of molten metal with Prandtl number close to 0.03. Experiments covered the range of numbers Pe equals 300 - 700. (Author)

AD-256 618 Div. 25, 8
(26 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
RESEARCHES OF UKRAINIAN SCIENTISTS IN THE FIELD OF PHYSICAL ELECTRONICS,
by N. D. Morgulis. 18 Nov 60, 11p. (Trans. no. FTS-9936 from Vestnik Akademii Nauk SSSR, pp. 51-55, 1957)
Unclassified report

DESCRIPTORS: *Electronics, USSR, *Solid state physics, Electron tubes, *Cathodes (Electron tubes), *Electrons, *Electrostatic generators, *Scientific research, *Plasma physics, Ions, *Linear accelerators, Electromagnetic waves, Semiconductors, Photoelectric materials, Photoemission, *Oxide cathodes, *Gas discharges.

AD-256 629 Div. 25, 26
(26 May 61) OTS price $2.60

Clevite Corp., Cleveland, Ohio.
STUDY OF METHODS FOR IMPROVING QUALITY OF SYNTHETIC QUARTZ,
by D. R. Hale and A. E. Carlson. Quarterly Technical rept. no. 2, 16 Jan 61-15 Apr 61. 23p. incl. table. (Rept. no. 14)
(Contract DA 36-039-sc-87372, Proj. 3A99-15-021-02)
Unclassified report

DESCRIPTORS: *Quartz crystals, *Quartz resonators, Growth, Production, Crystals, Materials, Tests, X rays, Test equipment, Quality control, Physical properties.

Eight hydrothermal growing experiments are in operation, of which five are expected to yield crystals large enough for making 1 mc fundamental resonator blanks. Experiments were made on a short time basis to investigate growth conditions such as: (1) use of potassium alkali solution, (2) vitreous silica feed, (3) silica gel feed, (4) baffle in 20-inch autoclave, and (5) plastic linings for ultra-purity conditions at low temperature. As a result of test experiments it is believed that silica gel and vitreous silica can be used as feed just as ordinary quartz. Growth in KOH solutions tended to yield quartz containing hairlike channels, believed to be liquid-vapor inclusions, extending parallel to the Z-axis often less than 1 mm long. In order to obtain specimens whose dislocation content is known, the X-ray techniques of Lang and of Borrmann were initiated. (Author)

AD-256 630 Div. 25
(26 May 61) OTS price $5.60

Columbia U., New York.
SOME QUASI-STATIC BOUNDARY VALUE PROBLEMS OF

CONSOLIDATING ELASTIC AND VISCOELASTIC MEDIA,
by A. M. Freudenthal and W. R. Spillers. Technical rept. no. 1, Feb 61, 43p. 22 refs. (Rept. no. CU 1-61 ORD 3032-CE)
(Contract DA 30-069-ORD-3032)
(AROD no. 41:1) Unclassified report

DESCRIPTORS: *Soils, *Elasticity, Loading, Viscosity, Mechanical properties, Theory, *Mechanics, Stresses, Integral transforms, Clays, Load distribution, Mathematical analysis.

Solutions are presented for various boundary value problems for the elastic and viscoelastic consolidating medium. In only one case was it possible to obtain simple closed-form solutions. The principal complication arose from the fact that in addition to the usual equations of equilibrium, a diffusion equation must be solved simultaneously. There does not appear to be sufficient data available to warrant any general comment of whether consolidation effects are significant in materials other than soil. It is concluded that for soil, the consolidating viscoelastic medium presents a rational approach to secondary consolidation. (Author)

AD-256 631 Div. 25, 15
(26 May 61) OTS price $3.60

Columbia U., New York.
VISCO-ELASTIC EFFECTS OF VOLUME VISCOSITY,
by A. M. Freudenthal, M. P. Bieniek and L. A. Henry. Technical rept. no. 2 (Final) Feb 61, 29p. (Rept. no. CU 2-61 ORD 3032-CE)
(Contract DA 30-069-ORD-3032)
(AROD no. N41:2) Unclassified report

DESCRIPTORS: Viscosity, Elasticity, Solids, Operators (Mathematics), *Stresses, Volume, Differential equations, Deformation, *Materials, Functions.

The effects of volumetric visco-elasticity are investigated for several linear visco-elastic materials under simple loading conditions. In particular, the operators V(D), corresponding to the Poisson ratio of an elastic solid, and the functions V(t) equals - E sub 22 (t)/E sub 11 (t) (where E sub 11 and E sub 22 are the longitudinal and the lateral strains in uniaxial state of stress) are discussed. (Author)

AD-256 635 Div. 25, 4
(26 May 61) OTS price $1.10

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
SPECTROSCOPIC ANALYSIS OF FLUORINE BY THE BaF BAND SPECTRUM,
by Keiichiro Fuha. May 61, 5p. (Technical notes no. FRL TN 71; Trans. from Nippon Kagaku Zasshi 76:14, 1955)
(In cooperation with Tokyo U.)
Unclassiffed report

DESCRIPTORS: *Fluorine, *Fluorides, *Barium compounds, *Spectrographic analysis, Japan, Sulfate.

In spectroscopic analysis of fluorine with the direct current arc light method, the CaF band spectrum (bh 5291.0A has been commonly used. When attempting to detect the amount of barium in Hokutoseki (BaSO4 in crystal form with PbSO4), the barium line of the spectrum interferes with observation of the CaF band spectrum. Thereupen, attempts were made to alleviate such interference by detecting and measuring the amount of fluorine by using the BaF band spectrum. Details of the experiment are given. Also results using the SrF band spectrum are given. (Author)

AD-256 645 Div. 25, 15
(26 May 61) OTS price $7.60

Illinois U., Urbana.
THE FRENKEL KONTOROVA DISLOCATION IN A DISCRETE LATTICE,
by R. Hobart. 28 Apr 61, 1v. incl. illus. 21 refs.
(Contract AF 49(638)819)
(AFOSR-647) Unclassified report

DESCRIPTORS: Solids, *Solid state physics, *Lattices, *Crystals, *Deformation, Mathematical analysis, Equations, Theory, Series, Difference equations, Numerical analysis, Atoms.

Contents:
The Frenkel-Kontorova model
A series solution and its convergence
Quasi-static displacement
One-atom force
A linearized model
Drag on a moving dislocation
Selected uniform motion
Conjecture
Moving and rest systems
Normal mode analysis
The buffeting drag force
Relation to three-dimensional models
Relation to the edge dislocation
A modified Peierls model
Appendix A. Numerical comparison
Appendix B. A spurious error

AD-256 651 Div. 25
(26 May 61) OTS price $1.60

Maryland U., College Park.
ANOMALOUS LATTICE SPECIFIC HEAT OF SUPERCONDUCTORS,
by Richard A. Ferrell. Apr 61, 15p. illus. (Technical rept. no. 209)
(Sponsored by the Air Force Office of Scientific Research and by the Office of Naval Research.)
Unclassified report

DESCRIPTORS: *Superconductors, Lattices, Specific heat, Thermodynamics, Excitation, Low temperature research, Electrons, *Indium, *Niobium, Theory, Ultrasonics, Attenuation.

The purpose of the present analysis is to emphasize that the specific heat anomaly is clear and unmistakable evidence for an anomalous dispersion in the phonon spectrum of the superconducting state. The a priori basis of such a dispersion is indicated, and it is shown that it gives a good quantitative account of the data. Several straightforward experimental tests of the theory are proposed. (Author)

AD-256 652 Div. 25, 2
(26 May 61) OTS price $1.60

Maryland U., College Park.
ENERGY SPECTRUM OF ELECTRONS TRAPPED IN THE GEOMAGNETIC FIELD,
by Martin Walt and William M. MacDonald. May 61, 16p. illus. (Technical rept. no. 216)
(Contract Nonr-179700) (In cooperation with Lockheed Aircraft Corp., Palo Alto, Calif.)
Unclassified report

DESCRIPTORS: *Statistical functions, *Statistical distributions, Van Allen radiation belt, Space environmental conditions, *Electrons, Density, Spectrographic analysis, Magnetic fields, *Terrestrial magnetism.

A Fokker-Planck equation for the distribution function of electrons trapped in a magnetic field in the presence of a scattering atmosphere is applied to the Van Allen electron belt. Solutions are obtained for the equilibrium flux resulting from an electron source of arbitrary energy for the cases where (a) loss of energy by collisions is neglected and (b) loss by diffusion out of the trapping region is neglected; and an approximate solution is obtained for the actual case where both processes are considered. The assumption that the electron source is supplied by decaying neutrons leads to an equilibrium electron flux whose energy dependence is qualitatively different from the observed spectrum. (Author)

AD-256 654 Div. 25, 8, 15
(26 May 61) OTS price $4.60

Electron Tube Lab., U. of Michigan.
NONLAMINAR ELECTRON STREAMS,
by Murray H. Miller. Mar 61, 46p. incl. illus.
(Technical rept. no. 47; Rept. no. 02854-13-T)
(Contract DA 36-039-sc-78260, Proj. 3-99-15-104)
Unclassified report

DESCRIPTORS: *Electron beams, *Turbulence, Electrons, Direct current, Fluid flow, Focusing, Magnetrons, Cathodes (Electron tubes), Motion, *Quantum statistics, Space charges, Velocity, Electromagnetic fields, Perturbation theory, Partial differential equations, Magnetic fields.

Rectilinear and axial Brillouin flow is discussed without a restriction to laminar motion. The sensitivity of the d-c characteristics of these flows to a small amount of nonlaminarity is calculated. Calculations are also made of the characteristics of space-charge wave propagation on a nonlaminar rectilinear flow, and compared with the laminar results. (Author)

AD-256 655 Div. 25, 8
(26 May 61) OTS price $1.10

New Mexico State U. of Agriculture, Engineering, and Science, University Park.
STUDY OF THE POTENTIAL WELL PRODUCED BY ELECTRON MULTIPACTING,
by H. B. Williams. Final rept. 1 Apr 60-31 Mar 61. 30 Apr 61, 3p.
(Grant no. DA-ORD-6)
(AROD rept. no. 2772:1) Unclassified report

DESCRIPTORS: Radiofrequency generators, *Electrons, *Ions, Electron charge, Gas discharges, *Electrodes, Computers, Low frequency, Oscillation, Electron transitions, Electron multipliers, Secondary emission, Discharge tubes.

The problem being studied is the production of a deep and stable three dimensional potential well produced by electron multipacting. Because unexpectedly low total electron multipacting currents were obtained a more thorough study of the multipacting process involving a computer program was iniated. Study of a new low frequency phenomenon was allowed because of its close association with the potential well mechanism. Optical spectra have not yet been obtained from the potential well. (Author)

AD-256 661 Div. 25, 4, 8
(26 May 61) OTS price $11.50

Pennsylvania U., Philadelphia.
THE SPECIFIC HEAT OF FERRITES AT LIQUID HELIUM TEMPERATURES,
by K. R. Atkins and S. R. Pollack. 1961, 1v. incl. illus. 58 refs. (Technical rept. no. 5)
(Contract Nonr-55128)
Unclassified report

DESCRIPTORS: Solids, *Solid state physics, *Low temperature research, *Ferrites, Ferromagnetic materials, *Specific heat, Energy, Quantum mechanics, Nuclear energy levels, Heat, Thermodynamics, *Nuclear spins, Crystals, Calorimeters, Helium, Liquified gases.

Contents:
Theory
  Derivation of the specific heat for a system of quantum Bose oscillators
  Phonon and magnon specific heat
Experimental descriptions
  Cryostat
  Calorimeter design and properties
  Experimental technique
Description of samples
  Fabrication and properties of samples
  Preparation of samples for calorimeter
Presentation of data
  Sample calculation
  Discussion of errors
  Description of experimental titles
Discussion of data
  Evaluation of Curie temperatures and exchange parameters
  Interpretation of T sub c, J, and A
  Cobalt ferrite

AD-256 664 Div. 25, 26
(26 May 61) OTS price $5.60

Radio Corp. of America, Harrison, N. J.
SOLID STATE IMAGE INTENSIFIER FOR INDUSTRIAL APPLICATIONS,
by R. W. Christensen. Final rept. 13 Mar 59-12 Apr 61. 28 Apr 61, 1v. incl. illus.
(Contract DA 36-034-ORD-2856)
Unclassified report

DESCRIPTORS: *Image intensifiers (Electronics), Electron tubes, Iconoscopes, Radiography, X-rays, *Industrial radiography, Sulfides, Fluoroscopes, Image tubes, Optical images, Sensitivity, Measurement, Design, Cadmium compounds, Industrial equipment, Photoconductivity, Non-destructive testing, Tests.

An investigation was made to study the feasibility of using solid state x-ray image intensifier in the field of industrial radiology. An analysis was made of the particular requirements the intensifier must satisfy to be useful in the field of industrial radiology. The techniques of making fine-grain panels were developed to the point that 6 in. x 6 in. intensifiers were made with a satisfactory yield. The technique of electronic erasure was demonstrated with some success. Penetrameter tests performed with 1/2 inch steel plate and using 350 kv x-rays demonstrated that the fine grain intensifier has better detail and contrast sensitivity than a typical fluoroscopic screen. (Author)

Division 25 - PHYSICS

AD-256 673 Div. 25, 8
(26 May 61) OTS price $8.10

Philco Corp., Blue Bell, Pa.
RESEARCH ON MONOCRYSTALLINE SEMICONDUCTOR FILMS,
by Maier Blomgren, Thomas J. Carroll and others.
Final technical rept. 31 Jan 61, 80p. 41 refs.
(Rept. no 2213-F)
(Contract AF 19(604)5522)
(AFCRL TR-61-155) Unclassified report

DESCRIPTORS: *Semiconductors, *Thin films, Crystals, Growth, Single crystals, Casting, Germanium, Production, Manufacturing methods, Processing, Electrolysis, Vapor plating, Intermetallic compounds, Electrodeposition, Theory, Adsorption, *Semiconducting films.

Research was conducted on the development of methods and procedures for the production of thin, single-crystal sheets or films of semiconducting materials including, but not limited to Ge. Several approaches were initiated including ribbon casting, growth from the vapor phase, various electrolytic techniques, wire casting, dendritic growth, and a photoelectric etching method. Each of the approaches yielded a measure of success, especially the dendritic growth process from vapor phase. Since these methods were limited in scope, particularly with regard to the growth of thinner films, a theoretical study is being made of a new technique, selective adsorption. This process basically implies an increased condensation coefficient for a particular angle of vapor incidence, which opens the possibility of oriented film formation irrespective of subtrate structure.

AD-256 674 Div. 25
(26 May 61) OTS price $2.60

Western Reserve U., Cleveland, Ohio.
RESEARCH ON SEMICONDUCTOR SURFACES. 1. THE ANOMALOUS FIELD EFFECT IN GERMANIUM. 2. THE FIELD EFFECT IN CADMIUM SULFIDE.
by John D. Nixon. Final technical rept. Sep 59-Sep 60. 1 May 61. 20p.
(Contract DA 33-019-ORD-3098)
(AROD rept. no. 2172:1) Unclassified report

DESCRIPTORS: *Semiconductors, Surfaces, Conductivity, *Cadmium compounds, *Sulfides, Single crystals, Lattices, *Electron transitions, Electrons, Mathematical analysis, Functions, Temperature, Materials, *Germanium, *Electric fields, Polarization.

AD-256 676 Div. 25, 15
(29 May 61) OTS price $2.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
SMALL DEFORMATIONS SUPERPOSED ON LARGE DEFORMATIONS IN MATERIALS WITH FADING MEMORY,
by A. C. Pipkin and R. S. Rivlin. May 61, 28p.
(Technical rept. no. 66; Rept. no. C11-66)
(Contract Nonr-56210, Proj. NR-064-406)
Unclassified report

DESCRIPTORS: *Stresses, *Deformation, *Functions, Tensor analysis, Matrix algebra, Functional analysis, Theory, Materials, Wave transmission.

The non-linear stress-deformation relation for materials with memory has been discussed by Green and Rivlin (Arch. Rat. Mech. Anal. 1:1, 1957) and Green, Rivlin and Spencer (Arch. Rat. ech. Anal. 3:82, 1959). In the present analysis the restricted form applicable to small dynamic deformations superposed on large static deformations is derived. Although this can be done by making an appropriate linearization of the final result of the non-linear theory, some of the complexities of that theory are avoided by introducing the linearization at an earlier stage. The results obtained will apply in particular to problems of wave propagation in finitely deformed viscoelastic bodies. (Author)

AD-256 690 Div. 25, 8, 17, 26
(29 May 61) OTS price $4.60

CBS Labs., Stamford, Conn.
STUDY OF MICROJUNCTION FORMATION TECHNOLOGY,
by A. Ramsa and R. Engelmann. Quarterly progress rept. no. 3, Dec 60-Feb 61, 31 Mar 61, 35p. incl. illus. (Rept. no. CLD-1392)
(Contract DA 36-039-sc-85337)
Unclassified report

DESCRIPTORS: *Semiconductors, Processing, Impurities, Silicon, Surfaces, *Electron beams, Ion beams, Electron bombardment, Ion bombardment, *Diodes, Gold wire, Nickel, Welding, Tin alloys, Silver alloys, Metal films, Aluminum compounds, Electrical proprties, Temperature, Packaging, Physical properties, *Subminiature electronic equipment.

The theory of the dependence of processing temperature on sample geometry is formulated. Results of electron-beam welding gold and nickel wires to silicon, and experiments on electron-beam alloying of tin and silver into silicon are reported. The successful fabrication of aluminum-silicon P-N junction diodes by electron-beam processing is described, giving optimum electron-beam current and voltage and showing the electrical characteristics of completed mesa diodes. (Author)

AD-256 699 Div. 25
(29 May 61) OTS price $4.60

Hudson Labs., Columbia U., Dobbs Ferry, N. Y.
SHALLOW WATER PROPAGATION TABLES. THREE-LAYER WAVEGUIDES,
by Ivan Tolstoy. 20 Dec 60, 45p. incl. illus. tables. (Technical rept. no. 75; Rept. no. CU-108-60-ONR-271-Phys.)
(Contract N6onr-27135)
Unclassified report

DESCRIPTORS: Propagation, Waveguides, Tables, Acoustics, Low frequency, Water, Sedimentation, *Sound transmission, Velocity, *Underwater sound transmission, *Underwater sound, Hydrophones.

A set of tables and graphs are given which may prove useful to persons working in shallow-water low-frequency acoustics. The quantities displayed can be used to describe the acoustic field of a source at ranges exceeding approximately ten water depths, and refer to a type of model frequently encountered in continental shelf areas. This model consists of a layer of water over a layer of sediment, over another sediment of infinite depth (half space). (Author)

AD-256 705 Div. 25
(29 May 61) OTS price $8.10

Gordon McKay Lab. of Applied Science, Harvard U., Cambridge, Mass.
PRESSURE DEPENDENCE OF FERRIMAGNETIC RESONANCE

PROPERTIES,
by I. P. Kaminow and R. V. Jones. 10 June 60, 78p. incl. illus. tables, 170 refs. (Scientific rept. no. 5, series 2)
(Contract AF 19(604)5487)
(AFCRL-181) Unclassified report

DESCRIPTORS: *Paramagnetic crystals, Solids, Solid state physics, Magnetism, *Paramagnetic resonance, *Lattices, *Antiferromagnetism, Magnetic properties, Ferrites, Garnet, *Ferromagnetism, Crystals, *Crystal structure, Hydrostatic pressure.

Contents:
Theoretical background
Ferromagnetic and ferrimagnetic resonance
Crystalline fields
Spin-orbit interactions
Paramagnetic and ferromagnetic anisotropy
Magnetization
The g-factor
Linewidth
Magnetoelastic effects
Experimental methods and errors
The spectrometer
Pressure generation
High pressure bomb
High pressure microwave plug
Microwave cavity
Crystal orientation
Assembled high pressure-resonance apparatus
Scatter due to temperature variations and linewidth
Absolute errors
Compressibility
Experimental results
The garnets, magnesium ferrite, nickel cobalt ferrite

AD-256 739 Div. 25, 4, 14
(31 May 61) OTS price $1.60

Arizona State U., Tempe.
RESEARCH TO PRODUCE A TEMPERATURE STABLE MATERIAL WITH A HIGH THERMOELECTRIC FIGURE OF MERIT,
by B. Gossick, L. Stubbe and others. Quarterly progress rept. no. 5, 18 Nov 60-17 Feb 61 on Thermoelectric Materials and Device Research. 17 Feb 61, 12p. incl. illus.
(Contract DA 36-029-sc-85249)
Unclassified report

DESCRIPTORS: *Thermoelectricity, *Semiconductors, *Titanium compounds, Dioxides, Production, Electrical properties, Colloids, Temperature, Materials, Tungsten, Tantalum, Stability, Preparation, High temperature research.

The transient behavior of rectifying barriers on reduced ceramic rutile was restudied in order to estimate the mobility and recombination time of holes. The repetition of experiments with a wider range of samples confirmed earlier estimates of representative lifetime (about 20 microseconds) and mobility (several hundred sq cm/volt/sec). An attempt to measure the drift mobility of holes by the Haynes-Shockley experiment failed for lack of proper equipment. The method of preparing high density, polycrystalline rutile directly from a precipitated form was studied. Controlled dehydration of TiO2 which had been precipitated from acid solution resulted in samples having densities of 4.25 g/cc, compared with 4.26 g/cc for single crystal rutile.

AD-256 763 Div. 25, 4
(31 May 61) OTS price $12.50

Lockheed Aircraft Corp., Sunnyvale, Calif.
PROPERTIES OF CADMIUM SULFIDE, ZINC SULFIDE AND MERCURIC SULFIDE. PARTS I-III. VOLUME I. AN ANNOTATED BIBLIOGRAPHY,
comp. by Helen M. Abbott. Mar 61, 166p. 403 refs. (Special Research Bibliography SRB-61-2)
Unclassified report

DESCRIPTORS: *Bibliography, *Sulfides, *Zinc compounds, *Mercury compounds, *Semiconductors, Crystals, Crystal structure, Growth, Single crystals, Crystallization, Optics, Electrical properties, *Luminescent materials, *Phosphors, Phosphorescence, Photoconductivity, *Phosphorescent materials, Fluorescence, *Cadmium compounds.

References were obtained from a search of the following sources: (1) Science Abstracts (A): 1950 - 1960; (2) Nuclear Science Abstracts: 1961 (Jan), 1951 - 1960; (3) Armed Services Technical Information Agency; and (4) Various periodicals translated from Russian. Volume I contains Part I: Crystal growth and crystalline properties; Part II: Electrical properties; and Part III: Optical properties. Volume II (AD-256 764) contains Part IV: Electro-optical properties. (Author)

AD-256 764 Div. 25, 4
(31 May 61) OTS price $9.10

Lockheed Aircraft Corp., Sunnyvale, Calif.
PROPERTIES OF CADMIUM SULFIDE, ZINC SULFIDE AND MERCURIC SULFIDE. PART IV. VOLUME II. AN ANNOTATED BIBLIOGRAPHY.
Mar 61, 98p. 241 refs. (Special Research Bibliography SRB-61-2)
Unclassified report

DESCRIPTORS: *Bibliography, *Sulfides, *Cadmium compounds, *Zinc compounds, *Mercury compounds, *Semiconductors, Photoconductivity, Phosphors, Electrical properties, Optics, Crystals, Single crystals, Luminescence, *Luminescent materials, *Phosphors, Phosphorescence, Phosphorescent materials, Photoelectric effect, Photoelectric cells.

Volume II contains Part IV: Electro-optical properties, and is subdivided into sections on photoconductivity, photo-voltaic, and electroluminescence. (Author)

AD-256 765 Div. 25, 2, 24
(31 May 61) OTS price $2.25

Naval Research Lab., Washington, D. C.
TRANSMISSION OF LIGHT IN WATER: AN ANNOTATED BIBLIOGRAPHY,
by Elsie F. DuPre and Leo H. Dawson. Apr 61, 79p. (NRL Bibliography no. 20)
Unclassified report

DESCRIPTORS: *Bibliography, Light, *Underwater photography, *Light transmission, Sea water, Brightness, Instrumentation, Hydrology, Luminescence, Optics, Lakes, Colors, Water.

This bibliography on the transmission of light and related optical properties of water records information published throughout the world and covers a period of 141 years, 1818-1959. Most of the entries are annotated with special attention to those on light transmission. Water, as used above, includes pure distilled water,

lake water, and seawater. Early papers, mainly of Swiss, German, French, and Italian origin, indicate the initial interest in the color of natural waters with subjective conclusions until Secchi in 1865 resolved to settle some of the questions with direct experiments on seawater. The history of progress of the study of light in water closely follows advances in photometric instrumentation. Entries on the subject from the various countries reflect their particular interest in the sea. This represents the contributions to hydro-optics of over 400 authors from over 150 periodicals and other sources. Arrangement is alphabetical by first author named. An author index, which includes co-authors, a subject index, and a geographical index are included. (Author)

AD-256 797 Div. 25, 7, 20
(29 May 61) OTS price $3.60

Aerospace Corp., El Segundo, Calif.
MAGNETOHYDRODYNAMIC VORTEX POWER GENERATION,
by W. S. Lewellen. 15 Mar 61, 32p. incl. illus. table. (Rept. no. TDR-594(1203-01)TN-2)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: *Magnetohydrodynamics, *Vortices, *Generators, Direct current, Vortex generators, Rocket motors, Exhaust gases, Nuclear power plants, *Electric power production, *Thermoelectricity, Astronautics.

The possibility of using a hydrodynamically driven vortex to convert thermal energy into electrical energy is investigated. Two promising areas of application as a space power generator are uncovered. The first is as a short term power supply when used in conjunction with a rocket exhaust and the second is a long term power supply when used in a closed cycle nuclear system. Estimates of the operating characteristics of the MHD vortex in both of these environments are presented. It is concluded that the open cycle MHD vortex should be competitive with other systems for operating times between a few seconds and an hour at power levels above a few kilowatts. It is also concluded that replacing the turbo-alternator package in a closed cycle nuclear system with an MHD vortex provides a potential increase in the specific power output (KW/lb) of the order of 100% for power levels above a few hundred kilowatts. (Author)

AD-256 801 Div. 25
(1 June 61) OTS price $7.60

Gordon McKay Lab. of Applied Science, Harvard U., Cambridge, Mass.
PRESSURE DEPENDENCE OF THE HALL CONSTANT OF THE ALKALI METALS,
by Thomas Frederick Deutsch. 1 July 60, 1v. incl. illus. tables, 85 refs. (Technical rept. no. HP-6)
(Contract Nonr-186610, Proj. NR 017-308)
Unclassified report

DESCRIPTORS: *Alkali metals, Pressure, *Hall effect, *Surfaces, Hydrostatic pressure, Measurement, Mathematical analysis, Theory, High pressure research, Metals, *Transport properties.

Recent band structure calculations indicate how the Fermi surface of the alkali metals, which is expected to be nearly spherical under normal conditions, may change when the lattice constant is decreased through hydrostatic pressure. Since direct measurement of the distortion of the Fermi surface is difficult, attempts were made to study its magnitude by measuring the Hall voltage in the alkalis as a function of hydrostatic pressure up to 15,000 kg/sq cm. In each case the Hall voltage decreased with increasing pressure, the size of the decrease ranging from 2% in 15,000 kg/sq cm for Li to 37% in 15,000 kg/sq cm for Cs before compressibility corrections are applied. The pressure results are explained in a semi-quantitative manner using a scattering time that varies by a factor of three over the Fermi surface. By contrast, the warping of the Fermi surface is small; with the exception of Cs, the electron wave vector at the Fermi surface deviates from the free electron value by less than 10%. (Author)

AD-256 803 Div. 25, 8, 15
(1 June 61) OTS price $2.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
WAVE FUNCTIONS FOR THE FREE ELECTRONS. II. THE INCLUSION OF POLARIZATION AND EXCHANGE,
by R. G. Breene, Jr. Dec 60, 23p. incl. illus. table. (Rept. no. TIS R60SD478)
(Contract AF 04(647)269)
Unclassified report

DESCRIPTORS: Quantum mechanics, *Electrons, *Polarization, Electron transitions, *Atoms, *Perturbation theory, Nuclei, Oxygen, Atomic charge, Atomic clouds, Computers, *Electron charge, Integral equations.

The effect of the polarization of the atomic core by the free electron on the free electron wave function and the effect of the exchange of the free electron with the bound orbitals on this wave function are treated by perturbation theory. Polarization must be considered first. Its effect on the atomic charge cloud is introduced through an expansion over the bound wave functions for the atom in terms of the free electron separation as a parameter. This parametric treatment of electron separation means we cannot accept the solution at small separations from the nucleus although this is not a serious restriction. From this wave function we obtain a polarized Coulomb potential from which a solution for the free electron function may be obtained using our old programs. Having solved the free electron wave equation with the exchange potential terms supposed zero, we use this solution to compute the exchange integrals. The equation including these integrals is then solved to obtain approximate wave functions for free electrons containing both exchange and polarization. (Author)

AD-256 809 Div. 25, 8
(29 May 61) OTS price $11.50

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
A SUMMARY OF CURRENT RESEARCH AT THE MICROWAVE

RESEARCH INSTITUTE,
by Ernst Weber. Progress rept. no. 19, 15 Sep 60-31 Mar 61. 31 Mar 61, 149p. incl. illus. tables (Rept. no. R-452.19-61)
(Contract AF 18(600)1505)

Unclassified report

DESCRIPTORS: Scientific research, Solids, *Microwaves, *Plasma physics, Materials, Microwave networks, *Electronics, *Electromagnetism, *Solid state physics, Semiconductors, Topology, Communication systems, Computers, Simulation.

Contents:
Electromagnetics
Plasma electrophysics and electronics
Solid state and materials research
Microwave circuits
Network theory
Systems and control

AD-256 889 Div. 25, 4
(2 June 61) OTS price $1.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
CONCERNING THE IDENTITY OF THE PREDOMINANT ACCEPTORS IN GaSb,
by Alan J. Strauss and Edward B. Owens.
24 April 61, 5p. 11 refs. (Rept. no. 83G-0031)
(Contract AF 19(604)7400)

Unclassified report

DESCRIPTORS: *Gallium compounds, Impurities, *Antimonides, Intermetallic compounds, Mass spectroscopy, *Semiconductors, Chemical impurities, Spectrographic analysis, Single crystals, Crystal structure, Purification, Detection, Lattices.

The uniformity of samples of GaSb prepared in different laboratories from different starting materials over an extended period suggested that the acceptors in the purest available GaSb were predominantly lattice defects associated with deviations from stoichiometry. In order to obtain additional evidence concerning the nature of the acceptors, an analysis was made of samples of GaSb cut from a single crystal which contained free hole concentrations from 1.25 to 1.55 x 10 to the 17th power/cc at room temperature. A spark source mass spectrograph was used which was capable of detecting any impurity element present at concentrations exceeding 1 x 10 to the 16th power/cc, provided no interference was produced between spectral lines by different isotopes and the proportion of residual gas ions striking the photographic plate were negligible. The analytical results appreciably increased the probability that the predominant acceptors in the purest available GaSb are lattice defects rather than impurity atoms. The suggestion is made that if the predominant acceptors are actually lattice defects that these defects may be Ga vacancies.

AD-256 894 Div. 25, 12
(2 June 61) OTS price $1.10

Little, Arthur D., Inc., Cambridge, Mass.
GAS CONDUCTION PROBLEM WITH MULTILAYERED RADIATION SHIELDS,
by A. G. Emslie. Apr 61, 16p. incl. illus. tables (Rept. no. 63270-04-01)
(Contract NAS5-664)

Unclassified report

DESCRIPTORS: *Spaceships, *Fuel tanks, *Liquefied gases, Thermal radiation, Heat transfer, *Thermal insulation, Insulating materials, Shielding, Thermodynamics, *Cryogenics, *Space flight, *Space environmental conditions, Liquid rocket propellants.

On a long mission in space, a cryogenic fuel tank may require 100 sheets of low-emissivity metal foil if heat is transferred through the shielding only by radiation. If gas conduction also occurs, more foils will be needed for the same rate of fuel boil-off. For a gas pressure of .00014 mm Hg, 200 foils are required. Consequently, an adequate sealed-off, evacuated shield is difficult to construct. If outgassing of the foils and gas diffusion from the fuel tank are appreciable, it is also difficult to arrange the geometry of the shields to use the external space vacuum for pumping. In the case of pumping through the edges of a 100-cm wide shield panel, the outgassing rate should not exceed about 10 to the 9th power molecules/sec from each sq cm of foil surface, if the number of foils is to remain about 100. The allowable outgassing rate for broadside pumping of optimally perforated foils is around 10 to the 10th power molecules per sec per sq cm. The allowable diffusion rate from the fuel tank is 10 to the 12th power molecules per sec per sq cm of tank surface. A basic consideration is that any geometrical arrangement of the foils that enhances pumping of the gas also reduces the effectiveness of the foils as a radiation shield, since radiation can enter by the same path by which molecules leave. As a result, only a limited number of layers of foil is useful. (Author)

26. PRODUCTION AND MANAGEMENT

AD-256 035 Div. 26, 17
(16 May 61) OTS price $3.60

Metcut Research Associates, Cincinnati, Ohio.
MACHINING OF REFRACTORY MATERIALS,
by L. J. Nowikowski, N. Zlatin, and M. Field.
Technical engineering rept. on Phase 2, 24 Jan-30 Apr 61. May 61, 28p. incl. illus.
(Contract AF 33(600)42349, Proj. 7-532a)
(AMC TR 7-532a, vol. 2) Unclassified report

DESCRIPTORS: *Refractory materials, *Machining, *Metals, *Alloys, *Steel, Drilling machines. Milling machines, Cutting tools, Cutting fluids, Carbide tools, Drills, Chromium alloys, Cobalt alloys, Molybdenum alloys, Tests, Nickel alloys, *Heat resistant alloys.

Machining studies were performed on Rene 41 solution treated to 321 BHN, Rene 41 aged to 365 BHN and D6AC steel quenched and tempered to 56 and 58 Rockwell-C(Rc). In drilling the Rene 41 alloy in both the solution treated and the aged conditions 50 to 60 holes could be drilled with a 1/4-in.-diam high speed steel drill at a cutting speed of 15 fpm, a feed of .002 in./revolution, with a highly chlorinated oil as a cutting fluid. A carbide evaluation in turning D6AC steel at 56 Rc shows that the best tool life obtained was with a C-8 type of carbide. Tool life for this carbide was over 50 min at a cutting speed of 95 fpm, a feed of .005 in./min and a depth of cut of .062 inches. The effect of cutting speed and feed on drill life in drilling D6AC with carbide tipped drills at 56 and 58 Rc was investigated. A drill life of 50 holes was obtained on the D6AC steel at 56 Rc at a cutting speed of 115 fpm and a feed of .001 in./revolution. At the higher hardness of 58 Rc, a drill life of 30 holes was obtained at a cutting speed of 85 fpm and a feed of .0005 in./revolution. (Author)

AD-256 102 Div. 26
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
CONCERNING THE CONDUCT OF THE FIRST INTERNATIONAL CONGRESS ON AUTOMATIC CONTROL IN MOSCOW.
10 Nov 60, 4p. (Trans. no. MCL-274 from Avtomatika, p. 94, 1959)
Unclassified report

DESCRIPTORS: *Industrial equipment, Control, Automation, Machines, Automatic, USSR.

AD-256 109 Div. 26, 17
(18 May 61) OTS price $1.60.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ELECTRONIC VACUUM WELDING (Elektronove Zvaranie Vo Vakuu)
by Vladimir Horacek, Cyril Chorvath and Blazena Trefilova. 8 Nov 60, 11p. (Trans. no. MCL-394 from Zvaranie 8:219-221, 1959)
Unclassified report

DESCRIPTORS: Refractory materials, USSR, *Welding, *Electron beams, Vacuum pumps, Vacuum apparatus, Cathodes, Tungsten, Beryllium, Zirconium, Uranium, Molybdenum, Titanium, Tantalum, Aluminum, Nickel, Steel, Sheets, Steel tubing, Metals, Alloys, Electronic equipment,

The principle of electronic vacuum (electron beam) welding is discussed and the equipment is described. The application of electronic vacuum welding should facilitate the fabrication of refractory and chemically active metals which currently are shaped by powder metallurgy techniques. The equipment for electronic welding consists of a stainless steel vacuum chamber, a highly efficient oil diffusion pump, a rotary oil pump, a clamping device for the workpiece, and a source of electrons consisting of a W cathode with the necessary focusing and accelerating equipment. Generally, a current of 2 amp and an accelerating voltage of 14,000 to 15,000 v are used. This affords 2 methods for controlling the kinetic energy of the electrons. Sheets and tubing from 0.1 to 4 mm thick have been welded, but these are not the limiting thicknesses. The area of the weld is less effected by electronic vacuum welding in comparison to the electric arc, welds have a uniform thickness, a brilliant mirror finish, and are free from surface craters and porosity.

AD-256 113 Div. 26
(18 May 61) OTS price $2.60.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
AUTOMATION OF PRODUCTION PROCESS IN MACHINE CONSTRUCTION,
by G. A Shaumyan. 8 Nov 61, 24p. incl. illus.
(Trans. no. MCL-449 from Avtomatizatsiya Proizvodstvennykh Protsessov v Mashinostroyenii, pp. 81-93; 106-110, 1958)
Unclassified report

DESCRIPTORS: *Industrial equipment, *Machines, Automatic, Automation, Production,

AD-256 123 Div. 26, 17
(18 May 61) OTS price $2.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ON BRITTLE FRACTURE OF WELDED STORAGE TANKS AND OTHER STRUCTURES (O Khrupkikh Razrusheniyakh Svarnykh Rezervuarov I Drugikh Konstruktsiy)
by G. V. Rayevskiy. 3 Nov 60, 28p. incl. illus. tables, 23 refs. (Trans. no. MCL-569 from Avtomaticheskaya Svarka, pp. 3-18, 1955)
Unclassified report

DESCRIPTORS: *Welds, *Welded joints, Fuel tanks, Welding, Cylindrical bodies, Ships, *Fuel storage tanks, Ship hulls, Steel, Failure (Mechanics), *Fracture (Mechanics), Design, Rupture, Temperature, Containers, Storage tanks, Bridges, Stresses.

The reasons for brittle fracture of welded structures are investigated. The conclusion is derived that increasing the cross section of components is not effective in preventing this type of failure. Ways of increasing structural strength without the use of additional metal are investigated. (Author)

AD-256 125 Div. 26
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SUMMARY OF REPORTS FOR 1957 (SELECTED ARTICLES)
10 Nov 60, 9p. illus. (Trans. no. MCL-590 from Referaty Rabot Za pp. 57-58; 151; 104-105; 148-149)
Unclassified report

DESCRIPTORS: *Machine tools, Machine tool industry, Automation, *Milling machines, Programming, Control systems, *Cast iron, Iron castings. Stresses, Measurement, *Magnetostriction, Function, Plastics, Resins, Surfaces, *Rolling mills, USSR, Manufacturing methods, Design.

CONTENTS:
Construction of High-Productivity Automatic Machine Tools, by A. O. Etin
Development of a Method and Instrument to Determine Internal Stresses in Castings by Magnetostriction, by O. U. Kotsyubinskiy
Search of New Plastic Materials for Machine-Tool Guides, by B. G. Lur'iyev and A. S. Lapidus
Experimental Tool for Rolling Grooved Shaft, by L. K. Manuilov and V. M. Misozhnikov.

AD-256 126 Div. 26
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
KINEMATIC CHAINS OF METAL-CUTTING MACHINE TOOLS (Kinematicheskiye Tsepi Metallorezhuyushchikh Stankov)
by N. I. Shavlyuga. 4 Nov 61, 12p. (Trans. no. MCL-591 from Kinematicheskiye Tsepi Metallorezhuyushchikh Stankov pp. 5-12, 1959)
Unclassified report

DESCRIPTORS: *Drive chains, *Machine tools, *Cutting tools, Metals, Theory, USSR, Mathematical analysis, Design, Gears.

The development of kinematic chains is reviewed including: (1) development of the theory of a series of numbers of spindle revolutions per minute and linkages of the kinematic layout of the gear box; (2) fundamental mathematical analysis of the theory of a series of numbers of revolutions as a whole and its individual rules, as well as methods for calculating the kinematic functions of toothed gear-shift boxes; (3) the theory of mathematical analysis and synthesis of kinematic chains of metal-cutting machine tools; (4) the study of the kinematic chains of automatic machine tools; and (5) the development of standardized power packs and type units for multipurpose machine tools. The advantage of arranging the stage series of the numbers of machine spindle revolutions per minute was according to a geometric progression.

AD-256 134 Div. 26
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
MACHINING AND ASSEMBLING (Mekhanicheskaya Obrabotka i Sborka)
by N. A. Razumov. 4 Nov 60, 11p. incl. illus. (Trans. no. MCL-612 from Kompleksnaya Mekhanizatsiya i Avtomatizatsiya v Mashinostroyenii, Seriya Chetvertaya (Series 4) 34:21-29, 1959)
Unclassified report

DESCRIPTORS: *Machining, Production, *Machines, Industrial equipment, USSR, Manufacturing methods, Machine tools, Automation, Automatic.

AD-256 136 Div. 26
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STANDARDIZED MACHINE TOOL DEVICES,
by Ye D. Vlaznev, S. V. Podgornov and others. 4 Nov 60. 3p. (Trans. no. MCL-615 from Normalizovannye Stanochnyye Prisposobleniya pp. 274-275, 1959)
Unclassified report

DESCRIPTORS: *Machine tools, USSR, Manufacturing methods, *Machines, Industrial equipment, Industrial production.

Experimental and small series manufacture is successfully employing so-called universal-assembling devices (USP). The structure of USP is assembled from ready made, geometrically simple, interchangeable, universal elements (parts and units) manufactured from a high quality material, with greater precision and with high degree of surface purity. Assembled contrivances are put to use, then disassembled and the very same elements are then used in the assembly of new structures. The number of needed USP parts may vary depending upon the nature of manufacture, from several hundreds to several thousands. The assembly of the equipment takes up an average of 2 - 5 hours (depending upon the complexity of the attachments). (Author)

AD-256 141 Div. 26, 17
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
THE PRODUCTION OF STEEL AND CASTINGS UNDER VACUUM,
by D. G. Lyubetskiy. 7 Nov 60, 5p. (Trans. no. MCL-633 from Proizvodstvo Stali i Otlivok v Vakuume 67:168-171, 1959)
Unclassified report

DESCRIPTORS: *Heat resistant alloys, *Steel, *Steel castings, Production, *Stainless steel, Manufacturing methods, *Casting, Vacuum apparatus, Processing, Vacuum furnaces, USSR, Metallurgy, Industrial production.

The use of vacuum in casting and pouring of metal is the most reliable and radical method of obtaining a sound and a close-grained metal for ingots and castings. The vacuum casting and pouring of steel provides the following: (1) a thorough reduction of the metal with a simultaneous active decarbonization; (2) a considerable decrease in the gas saturation of steel; and (3) a precise composition of metal. (Author)

AD-256 142 Div. 26
(18 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
GENERAL INFORMATION ON AUTOMATIC AND SEMIAUTOMATIC LATHES,
by M. P. Bondar, A. Y. Lopata, and M. L. Orlikov. 7 Nov 60, 9p. (Trans. no. MCL-634 from Tokarnyye Avtomaty i Polunvtomaty pp. 5-10, 1959)
Unclassified report

DESCRIPTORS: *Lathes, Automatic, Machine shop practice, Machine tool industry, Machining, Production, Industrial production, USSR.

AD-256 143 Div. 26, 17
(18 May 61) OTS price $3.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
HARD ALLOYS IN DIES,
by S. I. Yefremov. 7 Nov 60. 33p. (Trans. no. MCL-636 from Tverdyye Splavy v Shtampakh pp. 37, 1959)
Unclassified report

DESCRIPTORS: *Alloys, *Powder alloys, Powder metallurgy, *Casting, Tungsten alloys, Cobalt alloys, Carbides, Silicon alloys, Manganese alloys, Nickel alloys, Processing, Manufacturing methods, *Dies, USSR, Forging, Cermets.

The pamphlet discusses the properties of hard alloys, the inserts made out of them, the securing of the hard-alloy inserts or dies proper in the die holders for cold stamping work, and computing the dimensions of such inserts and master dies as well as the power of the press exerting the pressure. The pamphlet also gives a description of the electric-spark method of toughening the working parts by hard alloy. The pamphlet is intended for foremen and technicians working at cold stamping. (Author)

AD-256 147 Div. 26, 17
(18 May 61) OTS price $1.60.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DIE-CASTING BY SQUEEZING (Lit'ye Vyzhimaniem)
by S. Ya. Golovin. 7 Nov 60, 13p. incl. illus. (Trans. no. MCL-668 from Osobyye Vidy Lit'ya; Kratkiye Spravochnyye Materialy pp. 305-313, 1959)
Unclassified report

DESCRIPTORS: *Casting, Processing, *Dies, Metals, Melting, Fluid flow, Pressure, Industrial production, Design, Alloys, Manufacturing methods, USSR,

The squeeze casting process is described. This process consists of pouring the molten metal into the diffuser of the casting mold and moving the moveable die of the mold to the side of the fixed die at a constant angular velocity. As the dies draw together, the metal is squeezed upward from the receptacle filling the cavity of the mold between the dies. This method is characterized by the filling of the casting mode by (1) a flow of large cross section, which substantially decreases the hydrodynamic losses while the mold cavity is being filled; and (2) the shaping of the cast under conditions of continuous flow of molten metal in the filling of the mold. The continuous flow of molten metal around the solid skins forming on the mold walls results in a high-quality cast.

AD-256 148 Div. 26, 17
(18 May 61) OTS price $1.10.

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
ARC WELDING OF AUSTENITIC STEELS,
by B. I. Medover. 7 Nov 60, 4p. incl. table. (Trans. no. MCL-670) from Electrodugovaya Svarka Austenitnykh Staley pp. 81-84, 1958)
Unclassified report

DESCRIPTORS: *Nickel alloys, *Arc welding, *Austenite, *Steel, Sheets, *Welding, *Stainless steel, Alloys, Welded joints, USSR, *Heat resistant alloy,

Conditions are given for welding heat-resistant Ni-base alloys by (1) Ar-shielded arc welding, (2) welding in CO2, (3) submerged-arc welding, and (4) manual welding. Precipitation-hardened stainless steels in the form of thin sheets are welded primarily by the Ar-shielded arc method with a W or fusing electrode. For ADS 17-7PH steel containing more than 1% Al, a film of aluminum oxide forms on the joint necessitating the use of alternating current or replacing the Ar with He when welding with direct current. Steel 17-7PH can be welded without cracks. The presence of aluminum nitride causes porosity along the fusion line. In order to prevent this porosity, small amounts of Ti and Zr are introduced into the steel; these elements form nitrides more stable than the aluminum nitride. Preliminary hardening may be necessary before double heat-treatment in the case of welding thick 17-7PH steel in several passes when great structural alterations in the near-joint zone.

AD-256 157 Div. 26, 17
(18 May 61) OTS price $5.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
SOFT MAGNETIC MATERIALS IN POWDER METALLURGY (Magnitnom'yaki Metalokeramichni Materiali)
by O. O. Chekhova. 21 Sep 60, 55p. incl. tables, 27 refs. (Trans. no. MCL-683 from Vydavnytstvo Akademiyi Nauk Ukraeyins'koyi RSR, Kyyiv, 1959)
Unclassified report

DESCRIPTORS: *Powder metallurgy, Processing, *Magnetic materials, *Nickel alloys, *Iron alloys, Magnetic properties, Porosity, Mechanical properties, Heat treatment, Manufacturing methods, Powder alloys, Alloys, Metals, Ferromagnetic materials, USSR, Ferromagnetism,

A technology was developed for producing soft magnetic powder-metal materials from iron, permalloy (78% of Ni) and supermalloy. In case of the electrolytic Fe powder, the granulometric composition noticeably affected the porosity of specimens. The prolonged high-temperature annealing annulled almost completely the effect of dispersity of parent powders on the porosity of finished products. The curve of magnetic characteristics vs porosity (from 10 to 40%) was examined for specimens of electrolytic and reduced Fe. The difference between magnetic properties of electrolytic and reduced Fe was slight. The reduced Fe can be employed wholly for the manufacture of magnetic parts after a prolonged high-temperature annealing. Equations were acquired for porosity limits for electrolytic and reduced Fe. The process of manufacturing permalloy specimens proffers the possibility of acquiring a nearly cast material. When the porosity of the Fe, permalloy, and supermalloy specimen exceeds 10%, the E-modulus decreases with porosity more abruptly. (Author)

AD-256 168 Div. 26, 17
(18 May 61) OTS price $1.60

Titanium Metals Corp. of America, Toronto, Ohio.
TITANIUM SHEET ROLLING PROGRAM FOR Ti-8Al-1Mo-1V, Ti-5Al-5Sn-5Zr, AND Ti-7Al-12Zr,
by D. L. Day and H. D. Kessler. Bimonthly rept. no. 7, 1 July-31 Aug 60. 10 Apr 61. 9p. incl. tables.
(Contract NOa(s) 59-6227-c)
Unclassified report

DESCRIPTORS: *Titanium alloys, Aluminum alloys, Molybdenum alloys, Vanadium alloys, Sheets, Tin alloys, Zirconium alloys, Processing, Production, Heat treatment, Rolling mills, Creep, Grains (Metallurgy), Mechanical properties, Temperature, Tensile properties.

A comprehensive laboratory study was undertaken to determine the effects of various simple and mill annealing cycles on the 1000F creep resistance of Ti-8Al-1Mo-1V sheet and to establish an annealing treatment which will provide substantially better creep properties than have been afforded by mill annealing at 1350F (8 hrs). Five 1600-pound ingots of Ti-8Al-1Mo-1V were pressed to slabs, chemically analyzed, and bars rolled to an intermediate size. Processing of the initial 18 sheets of Ti-5Al-5Sn-5Zr and Ti-7Al-12Zr was completed and preliminary tensile and bend tests were made, the results of which showed that good mill annealed strength and ductility levels were achieved in material from both alloys. (Author)

AD-256 214 Div. 26, 8, 14
(18 May 61) OTS price $4.60

Radio Corp. of America, Somerville, N. J.
MICRO-MODULE CRYSTAL UNITS,
by R. R. Bigler, E. Cohen, and N. H. Liederbach.
Final rept. 1 July 60-31 Mar 61. 31 Mar 61, 1v. incl. illus. tables.
(Contract DA 36-039-sc-85046, Proj. 3A 99 15-001-02)
Unclassified report

DESCRIPTORS: *Quartz crystals, Crystals, *Piezoelectric crystals, *Subminiature electronic equipment, Packaging, *Containers, Ceramic materials, Electroplating, Nickel plating, Copper coatings, Seals, Soldering, Tests, Aging, Manufacturing methods, Design.

A ceramic crystal-microelement package was demonstrated to be a practical package capable of meeting all requirements of the Signal Corps Micro-Module program; The packages were made from metallized-ceramic layers. Electrical connections from the notches to the crystal plate were laminated laterally between the layers of ceramic. After firing, the electrical connections and the seal ring were electroplated with nickel, then with copper. The units were tested for hermeticity and solder dipped. Quartz plates with a nominal frequency of 10 mc were used to evaluate the package. The plates were mounted; then, metal caps were ultrasonically soldered in place to seal the packages. A tip-off hole was required in the cap to allow entrapped gas to escape during sealing. This hole was subsequently sealed in a hand-soldering operation. Ultrasonic welding of the cap was also demonstrated. Sealed microelements successfully passed vibration and shock, and temperature-characteristic tests. Two units were encapsulated in element-test Micro-Modules and subjected to 30-day aging tests. Both units remained within the specified limits. (Author)

AD-256 220 Div. 26, 17
(18 May 61) OTS price $1.60

National Research Corp., Cambridge, Mass.
PREPARATION OF ULTRAFINE HIGH PURITY REFRACTORY METAL POWDERS,
by Philip J. Clough. Final rept. 5 Apr 61, 15p. incl. illus. tables.
(Contract NOa(s) 60-6003-c)
Unclassified report

DESCRIPTORS: Heat resistant alloys, *Powder metallurgy, Metals, *Powder alloys, Alloys, Refractory materials, Electron beams, Electron guns, Vaporization, Evaporation, Condensation, Melting, Molybdenum, Aluminum alloys, Aluminum compounds, Oxides, Mechanical properties, Processing, *Powder metals, Preparation.

Results are reported of an effort to establish procedures for producing ultrafine high purity powders of the refractory metals. The powders are to have smaller particle size and higher purity than those currently available. The power source was an electron beam; originally it was recommended that the beam be bent 45 degrees to prevent cathode contamination. However, at a pressure of 20 microns, Mo metal vapor was condensed in a relatively short space; the conclusion was made that the beam need not be bent to that great a degree, but could be nearly straight. The basic principles of the method proved sound; a small quantity of submicron Mo metal powder was produced. Work reported on an aluminum-alumina alloy established that the strength of the alloy can be raised as the particle size is decreased. Specimens heated to 70 and 160 degrees above the melting point of Al were stiff and no melting was obtained.

AD-256 224 Div. 26, 27
(18 May 61) OTS price $1.10

Massachusetts Inst. of Tech. Div. of Sponsored Research, Cambridge.
EVALUATION OF ELECTRON BEAM WELDING FOR FABRICATION OF ULTRA HIGH STRENGTH STEEL ROCKET MOTOR CASES,
by C. M. Adams, Jr. Monthly status rept. no. 8, 1-31 Dec 60. 24 Feb 61, 2p. tables.
(Contract NOw 60-0417)
Unclassified report

DESCRIPTORS: *Welding, *Electric welding, Electron beams, Electron guns, *Welds, Steel, Rocket cases, Rocket motors, Electronic equipment.

AD-256 225 Div. 26, 27
(18 May 61) OTS price $1.10

Massachusetts Inst. of Tech. Div. of Sponsored Research, Cambridge.
EVALUATION OF ELECTRON BEAM WELDING FOR FABRICATION OF ULTRA HIGH STRENGTH STEEL ROCKET MOTOR CASES,
by C. M. Adams, Jr. Monthly status rept. no. 9, 1-31 Jan 61. 17 Mar 61, 2p. tables.
(Contract NOw 60-0417)
Unclassified report

DESCRIPTORS: *Welding, *Electric welding, Electron beams, Electron guns, *Welds, Heat treatment, Tensile properties, Steel, *Rocket cases, Rocket motors, Mechanical properties, Surface properties, Electronic equipment.

AD-256 226 Div. 26, 27
(18 May 61) OTS price $1.10

Massachusetts Inst. of Tech. Div. of Sponsored Research, Cambridge.
EVALUATION OF ELECTRON BEAM WELDING FOR FABRICA-

TION OF ULTRA HIGH STRENGTH STEEL ROCKET MOTOR CASES,
by C. M. Adams, Jr. Monthly status rept. no. 10, 1-28 Feb 61. 7 Apr 61, 2p. table.
(Contract NOw 60-0417)

Unclassified report

DESCRIPTORS: *Welding, Electric welding, *Electron beams, Electron gases, *Welds, Welded joints, Sheets, Metal plates, Steel, Tungsten, Gases, Failure (Mechanics), Test methods, Tests, Rocket cases, Rocket motors, Electronic equipment, Tensile properties, Mechanical properties.

Tests were performed to qualify a special test bar design for obtaining strength data on sheet or plate welds under 2:1 biaxial loading conditions. The specimen was a flat tensile test bar into which identical grooves were milled on both sides of the test section, opposite one another, in a direction perpendicular to that of loading. Limits were established for groove dimensions which yielded conditions of substantially plane strain. Results of biaxial tensile tests performed on electron beam welds showed strengths that were of the order of 10% higher than those determined on the same welds using conventional test specimens. As a groove in the parent material will promote the strength about 10%, it was concluded the weld metal has the same biaxial strength as the parent material. Biaxial strengths of TIG welds appeared to be somewhat lower than those of electron beam welds. Failure with electron beam welds occurred frequently at a location fairly remote from the weld (1/4 in. away).

AD-256 376 Div. 26, 14
(22 May 61) OTS price $1.10

Material Lab., New York Naval Shipyard, Brooklyn.
DEVELOPMENT OF DISPOSABLE TYPE CONTAINERS FOR PACKAGING AND PACKING OF ACIDS (TECHNICAL) AND ELECTROLYTES.
Progress rept. no. 2. 19 May 61, 8p. incl. illus.
(Lab. proj. 6238)

Unclassified report

DESCRIPTORS: *Containers, *Packaging, Hydrogen compounds, Storage, *Acids, Aging, Fluorides, Temperature, *Electrolytes, Pumps, Handling, Plastics, Climatic factors, Ethylenes, Polymers.

Outdoor aging and aging at elevated temperatures is underway with starting dates extending from Oct through Dec 1960, inclusive. Aging of small, plastic containers at standard conditions, (70 F and 50% relative humidity) has been started for the purpose of providing comparative weight-loss data under different conditions; acids in glass bottles serve as the controls. Quantitative test results are not yet available. However, periodic observation of the acid-filled containers revealed bulging of the outer container in those containing HF. All HF containers will be provided with vent-holes or slits in their closures. Modifications of the test procedures are listed.

AD-256 465 Div. 26
(23 May 61) OTS price $7.60

Arde-Portland, Inc., Paramus, N. J.
CRYOGENIC STRETCH FORMING OF ROCKET MOTOR CASES,
by R. H. Alper. Final rept. 15 May 61, 69p. incl. illus. tables.
(Contract NOw 60-0263-c)

Unclassified report

DESCRIPTORS: *Rocket cases, *Cryogenics, Stainless steel, Cylindrical bodies, Welds, Welding, High pressure research, Processing, Manufacturing methods, Pressure, Metal forming process.

An experimental program was conducted to establish the feasibility of manufacturing ultra-high strength rocket motor cases by stretch forming preforms constructed of 301 stainless steel sheet at -320 F. Experimental cases were produced which achieved 260,000 psi nominal ultimate strength at room temperature. It was demonstrated that close dimensional control of cylindrical cases could be obtained by stretch forming in a die. Process controls were established for the fabrication of preforms. The dependence of material cryogenic properties and weldability on composition was observed, and material specifications were established. Some preform and die design parameters were investigated and established experimentally. (Author)

AD-256 471 Div. 26, 1, 12
(22 May 61) OTS price $2.60

Almay Research and Testing Corp., Los Angeles, Calif.
STUDY AND INVESTIGATION OF RIVETED JOINT DESIGN CRITERIA FOR NAVAL AIRCRAFT AND MISSILES,
by Harry S. Brenner. 13 Sep 60, 31p. incl. illus. tables (Rept. no. G 8030)
(Contract NOw 60-0108-c)

Unclassified report

DESCRIPTORS: *Rivets, *Riveted joints, Sheets, Metals, Aluminum, Alloys, Aluminum alloys, Airframes, Structural shells, Aircraft, Guided missiles, Specifications, Standardization, Test methods, Creep, Fatigue (Mechanics), Rupture, High temperature research, Low temperature research, Cryogenics, Design.

The following recommendations were made: (1) retain existing MIL-HDBK-5 rivet criteria for piloted aircraft; propose new criteria for missiles and pilotless aircraft; (2) initiate a design standard defining details of test specimens, yield criteria determination, rivet patterns edge distances, sheet thickness, rates of loading, heating rates, etc; (3) institute a BuWeps bulletin for release of recommended rivet-joint allowables on new rivets and sheet materials; (4) undertake a test program for development of room and short-time elevated temperature load allowable for A 286 solid rivets; (5) propose criteria for Al alloy rivets in Al alloy sheet materials; (6) correlate available rivet test information for recommended load allowables; (7) outline an ultra-short-time elevated temperature research and testing program; and (8) incidental to items (4) and (7) obtain information on creep and/or creep-rupture and fatigue strength of rivet joints at elevated temperatures.

AD-256 483 Div. 26, 1, 12, 19
(22 May 61) OTS price $1.10

General Electric Co., Philadelphia, Pa.
STUDY OF PARAMETERS WHICH AFFECT PELLET FLOW TYPE ACCELEROMETERS,
by William Nicolini. Monthly rept. no. 1, 11 May-30 June 60. 30 June 60, 6p.
(Contract DA 36-034-ORD-3230)

Unclassified report

DESCRIPTORS: Pellets, *Accelerometers, Spheres, Glass, *Processing, *Surface properties, Friction.

The Applied Mathematics Unit of the Laboratory started a study of geometrical and frictional parameters affecting accelerometer performance. The study will encompass round, annular and rectangular orifices. It will start with ideal conditions of unidirectional motion, no friction, no geometrical flow restriction, sharp edged orifices, constant density beads, constant size beads, and all spherical beads, and will be extended to determine the effect of non-ideality on theoretical bead flow rate. The effect of packing arrangement will also be studied. (Author)

AD-256 484 Div. 26, 1, 12, 19
(22 May 61) OTS price $1.60

General Electric Co., Philadelphia, Pa.
STUDY OF PARAMETERS WHICH AFFECT PELLET FLOW TYPE ACCELEROMETERS,
by William Nicolini. Monthly rept. no. 2, 30 June-31 July 60. 31 July 60, 17p. incl. illus. (Contract DA 36-034-ORD-3230)
Unclassified report

DESCRIPTORS: *Accelerometers, Mathematical analysis, *Processing, Spheres, Friction, *Surface properties, Glass, Pellets.

Contents:
Purchasing of beads
Separation of beads by size and shape
Efficiency of ASTM roundometer
Surface roughness of glass beads
Consultation with glass experts
Mathematical analysis
Evaluation of test procedures
Cleaning of glass beads

AD-256 564 Div. 26, 17, 27
(24 May 61) OTS price $11.00

Wright Aeronautical Div., Curtiss-Wright Corp., Wood-Ridge, N. J.
RADIAL EXTRUSION OF TURBOJET DISCS,
by Robert W. Krohn. Interim engineering rept. no. 9, 1 Oct-31 Dec 60. 31 Dec 60, 139p. incl. illus. tables (Serial rept. no. MP 00-227)
(Contract AF 33(600)37191)
Unclassified report

DESCRIPTORS: *Turbojet engines, Processing, *Gas turbine disks, Steel, Titanium alloys, Forging, Forge presses, Dies, Extrusion, Manufacturing methods, Production, Cooling, Temperature, Lubricants, Coatings, Design, Surfaces, Mechanical properties, Hardness, Microstructure, Metal forming presses, Disks, Drawing (Machine processing).

Full-scale AMS 6342 steel compressor disks can be precision forged by radial extrusion techniques with the following benefits: (1) Web thicknesses to blueprint with virtually no carburization and tolerance; (2) press tonnages at approximately 1/2 those needed for conventional forging methods; and (3) metal volume overages of 29.6% instead of 230% obtained in conventional forging techniques. Full-scale AMS 4928 titanium compressor disks can be semi-precision forged by radial extrusion techniques at press tonnages of approximately 57% of those required for conventional forging methods. Precision forging AMS 4928 titanium compressor disks by radial extrusion techniques to blueprint web thicknesses is hindered by surface contamination and poor surface finish. (Author)

AD-256 649 Div. 26, 22
(26 May 61) OTS price $8.10

Lake City Arsenal, Independence, Mo.
HYDRAULIC CRIMPING UNIT FOR LARGE CALIBER SMALL ARMS AMMUNITION,
by H. L. McLean. May 61, 85p. incl. illus. tables. (IED rept. no. 60-12)
(Proj. 56-242)
Unclassified report

DESCRIPTORS: Hydraulic fluids, Pressure, Seals, Test equipment, Machining, *Crimping tools, *Small arms ammunition, *Projectiles, *Cartridge cases, Rubber, Synthetic rubber, Statistical analyses, Automatic, *Quality control, Ammunition, Attachment, Hydraulic systems, Production.

An investigation was made of the feasibility and adaptability of the basic principles of hydraulic crimping unit for use in mass production in crimping 20mm cartridges, Test equipment was designed and constructed for testing various types of resilient materials. Several design variations were produced and materials tested prior to obtaining a suitable design and material for the crimp ring and seal ring. It was demonstrated that the principles of hydraulic crimping were feasible for adaptation to the V&O Automatic Machine for use in mass production in crimping 20mm cartridges. This method of crimping 20mm cartridges maintains projectile extraction loads, torsion requirements between case and projectile, and moisture sealing qualities within control limits; minimizes cold-working of the case metal. (Author)

AD-256 657 Div. 26, 14
(26 May 61) OTS price $1.10

Narmco Industries, Inc., San Diego, Calif.
POTENTIAL OF FILAMENT WOUND COMPOSITES,
by B. Duft, S. Dharmarajan, and W. Otto. Monthly progress rept. no. 2, 1-30 Apr 61. May 61, 6p. illus.
(Contract NOw61-0623-c)
Unclassified report

DESCRIPTORS: *Filament wound construction, *Glass textiles, *Resins, Glass, Laminates, Failure (Mechanics), Stresses, Mathematical analysis, Thermal stresses, Tensile properties, Reinforcing materials, Theory, Mechanical properties, Filaments.

Analysis was directed toward obtaining a quantitative estimate of the residual stresses resulting from curing of a glass monofilament encased in a concentric cylinder of resin. As the composite is cured, in general, it develops residual tensile stresses which will add to those produced by the external loading to initiate cracks in the resin. These cracks will expose the surface of the fiber and provide sites for fracture initiation in the composite. The stresses at the interface of filament and resin were analyzed. The axial stress in the resin will be the decisive stress to initiate crack in the resin in a direction perpendicular to the axis of the composite. This will break the resin into lengths which will depend upon the shear strength of the resin. The optimum design of the composite is shown as a function of the resin content and glass content. (Author)

rapidly preparing reproducible, thick, TaC-7 wt-% Fe - 1 wt-% Ni coatings on ATJ graphite by electrophoretic deposition. Although the coatings were extremely adherent, defects in the form of tiny fissures and cracks were developed during the cooling cycle. Six TaC-coated, graphite rocket nozzle inserts were tested in the Naval Ordnance Laboratory H2-O2 rocket motor. The best of the test inserts maintained chamber pressure for approximately 5.5 sec before failure. Examination of the coated inserts after tests showed extensive damage in the throat area. (Author)

AD-256 619 Div. 27
(26 May 61) OTS price $1.10

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
STORIES OF AVIATION DESIGNERS ON UNBEATEN PATHS,
by A. Tarasov. 18 Nov 60, 6p. (Trans. no. FTS-9971 from Kryl'ya Rodiny, pp. 7-8, 1958)
Unclassified report

DESCRIPTORS: *Airplane engines, *Jet engines, USSR.

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-256 036 Div. 28, 30, 32
(17 May 61) OTS price $2.60

Institute for Social Research, U. of Michigan, Ann Arbor.
DIMENSIONS OF ORGANIZATIONAL ATMOSPHERE,
by Frank M. Andrews and Donald C. Pelz. Interim technical rept. (Analysis Memo. no. 7) on Stimulating and Inhibiting Factors in Scientific Performance: Partial Support. 1 Feb 61. 23p. incl. tables.
(Grant no. DA ORD-31-124-61-G18)
(OOR rept. no. 0010:3) Unclassified report

DESCRIPTORS: Laboratories, *Group dynamics, Needs, Social communication, Research program administration, Adjustment (Psychology), *Management engineering, Industrial psychology, Industrial relations, *Scientific organizations, Sociometrics.

AD-256 037 Div. 28, 23, 26, 32
(17 May 61) OTS price $1.10

Institute for Social Research, U. of Michigan, Ann Arbor.
STIMULATING AND INHIBITING FACTORS IN SCIENTIFIC PERFORMANCE: PARTIAL SUPPORT,
by Donald C. Pelz and Frank M. Andrews. Final rept. 15 Apr 61. 3p.
(OOR rept. no. 0010:4) Unclassified report

DESCRIPTORS: *Scientific organizations, Scientific research, *Scientific personnel, Needs, Group dynamics, Laboratories, Industrial psychology, Sociometrics, Production, Behavior, Statistical analysis, Stimulation, Inhibition.

Contents:
Some properties of the measures of scientific output
Dimensions of organizational atmosphere
Organizational atmosphere, as related to types of motives and levels of output

AD-256 039 Div. 28, 5, 6
(17 May 61) OTS price $4.60

Institute of Science and Tech., U. of Michigan, Ann Arbor.
TIME REQUIRED FOR TARGET DETECTION IN COMPLEX ABSTRACT VISUAL DISPLAY,
by Stanley W. Smith. Memo rept. on Project Michigan. Apr 61, 34p. incl. illus. tables, 11 refs. (Rept. no. 2900-235-R)
(Contract DA 36-039-sc-78801, Project Michigan)
Unclassified report

DESCRIPTORS: *Human engineering, Targets, *Target recognition, *Display systems, *Reaction time, Sensory perception, Statistical analysis, Visual perception, Vision.

The effects on search time (t) of two display variables were investigated: (1) the number of objects present in the display (N), and (2) the similarity between the object sought (target) and nontarget objects (pseudotargets). Projected displays consisting of discrete, sharply defined, randomly distributed objects were presented to a group of four observers. The objects were all considerably brighter than the field. All pseudotargets in a display were identical. The effects of differences between target and pseudotargets in terms of size and contrast were investigated by using a 4 x 4 (size x contrast) factorial design. The target was a square, and the pseudotargets were circles. N was 256. As contrast difference between target and pseudotargets increased, search time decreased. Size differences had a similar but somewhat greater effect on search time. In every case where the target and pseudotargets differed in both size and contrast, median search time was shorter than when either difference was used alone. In the third part of this study N was 256 and the pseudotargets were circles of the same contrast and size as the targets. The targets used were regular polygons: triangle, square, pentagon, and hexagon. Search time increased regularly as the number of sides of the target increased. (Author)

AD-256 313 Div. 28
(18 May 61) OTS price $3.60

National Research Council, Washington, D. C.
HUMAN PERFORMANCE AS A FUNCTION OF THE WORK-REST CYCLE. A REVIEW OF SELECTED STUDIES,
by James T. Ray, O. Edmund Martin, Jr., and Earl A. Alluisi. Rept. on Human Performance in Advanced Systems. Oct 60, 32p. incl. illus. 76 refs. (NRC Publication no. 882)
(In cooperation with Lockheed Aircraft Corp., Marietta, Ga., Contract AF 33(616)6050, Proj. 7184)
Unclassified report

DESCRIPTORS: *Industrial psychology, *Human engineering, *Industrial production, Tests, Scheduling, *Adjustment (Psychology), Stress (Physiology), Job analysis, Fatigue (Physiology), Attention, Stress (Psychology).

Studies relating to the effects of different work-rest cycles on man's performance are reviewed in this report. Included are only those studies in which (1) observations of performance extend for 24 hours or longer, and (2) results pertain to the general problem of optimizing performance through the scheduling of work and rest periods. While several specific conclusions are supported by the studies reviewed, the number of generalizations relating to optimal work-rest cycles, sleep-wakefulness cycles, and the durations of the work, rest, and sleep periods. The need for additional long-term experimentation is evident. (Author)

AD-256 361 Div. 28, 32
(22 May 61) OTS price $2.60

Georgetown U. Medical Center, Washington, D. C.
ON EGO AND SOCIAL IDENTIFICATION,
by John H. Rohrer. Apr 61, 21p. 15 refs.
(Contract Nonr-153007)
Unclassified report

DESCRIPTORS: Group dynamics, *Sociology, *Psychology, *Personality, Psychiatry, *Psychoneuroses, Emotions, Behavior, Anxiety.

A study was made of various instinctual and/or biological drives which impel man to action. As a result of his learning experiences, man develops certain expectancies growing out of his own experientially developed conceptions and perceptions of himself. He finds himself in a culture which provides a variety, although not an infinite number, of ways in which these gratifications can be achieved. This world also provides ways of punishing his attempted role behaviors that are not sanctioned within the culture. These punishments are, affectively speaking, painful. The instrumentalities which permit the individual to seek out gratifications and avoid anxieties, as dictated by his own ego structure, function, and identity, from the culturally created social structure, function, and objectively defined social indentificatios, are assigned to the notion of the status positions which he occupies, the attendant role behaviors, and values the latter two of which are learned. The hierarchical manner in which one orders his role behaviors in terms of relative importance, is determined in large part by the values attendant to those status clusters. These values, in turn, are related to intra-psychic gratification of drives on the one hand and on the other, the gratification potentialities offered by the configurations of social status clusters with which he is identified, as well as those that society has identified him with. (Author)

AD-256 383 Div. 28, 16
(17 May 61) OTS price $1.60

Naval Medical Research Lab., New London, Conn.
SOME PRIMARY AUDITORY ABILITIES IN PITCH AND LOUDNESS,
by John J. O'Hare, J. Donald Harris and others. 15 Sep 59, 7p. incl. tables, 25 refs. (MRL rept. no. 316; Vol. 18, no. 11)
(Proj. NM 22 01 20.02.02)
Unclassified report

DESCRIPTORS: Auditory acuity, Intensity, Ear, *Hearing, Tests, Sound, *Acoustics, *Pitch discrimination, Signals, Detection, Factor analysis, Noise, Memory.

Ninety-two young men with normal auditory acuity were given 18 separate auditory tests involving frequency, intensity, and contact detection. Test data were intercorrelated and factor analyzed by a centroid technique. The following factors were identified: pitch-memory, pitch-modulation, loudness/masking in noise, complex auditory determination and loudness, discrimination at 1,000 cps, and masking for 1,000 cps in wide-band noise. The two pitch factors were correlated more closely than were the loudness or masking factors. Evidently, the loudness domain was not covered sufficiently by the tests used to provide a further discription of loudness discrimination. Another matrix of loudness tests alone is envisaged. (Author)

AD-256 488 Div. 28, 16, 18
(22 May 61) OTS price $1.60

Human Factors Research, Inc., Los Angeles, Calif.
A BIBLIOGRAPHY OF RESEARCH ON HUMAN VIGILANCE,
by James J. McGrath. Rept. on Human Factor Problems in Anti-Submarine Warfare. Apr 61, 15p. (Supplementary note to Technical rept. no. 1, AD-237 691)
(Contract Nonr-264900, Proj. NR 153-199)
Unclassified report

DESCRIPTORS: *Antisubmarine warfare, Display systems, *Attention, *Bibliography, Human engineering, Sensory perception, Visual acuity, Visual perception.

AD-256 582 Div. 28, 30
(25 May 61) OTS price $28.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
PRINCIPLES OF NEURODYNAMICS. PERCEPTRONS AND THE THEORY OF BRAIN MECHANISMS,
by Frank Rosenblatt. 15 Mar 61, 622p. incl. illus. tables, 116 refs. (Rept. no. VG-1196-G-8)
(Contracts Nonr-238100, Proj. PARA and Nonr-40140)
Unclassified report

DESCRIPTORS: *Cybernetics, Theory, Brain, *Perception, Computers, Psychology, Nervous system, Mathematical analysis.

Part I attempts to review the background, basic sources of data, concepts, and methodology to be employed in the study of perceptrons. In Chapter 2, a brief review of the main alternative approaches to the development of brain models is presented. Chapter 3 considers the physiological and psychological criteria for a suitable model, and attempts to evaluate the empirical evidence which is available on several important issues. Chapter 4 contains basic definitions and some of the notation to be used in later sections are presented. Parts II and III are devoted to a summary of the established theoretical results obtained to date. Part II (Chapters 5 through 14) deals with the theory of three-layer series-coupled perceptrons, on which most work has been done to date. Part III (Chapters 15 through 20) deals with the theory of multi-layer and cross-coupled perceptrons. Part IV is concerned with more speculative models and problems for future analysis. Of necessity, the final chapters become increasingly heuristic in character, as the theory of perceptrons is not yet complete, and new possibilities are continually coming to light. (Author)

AD-256 625 Div. 28, 5
(26 May 61) OTS price $1.60

Bureau of Naval Personnel, Washington, D. C.
VULNERABILITY OF HUMAN PERFORMANCE IN COMMUNICATIONS,
by Francis L. Harmon and Bert T. King. Jan 61, 13p. 16 refs. (Technical bull. 61-1)
Unclassified report

AD-256 160 Div. 30
(22 May 61) OTS price $9.10

Sylvania Electronic Systems, Needham, Mass.
MOBILE DIGITAL COMPUTER PROGRAM MOBIDIC B. (ADDENDUM)
by E. W. Jervis, Jr. 7 Dec 60, 1v. incl. illus. tables (Rept. no. Q53-7(ADD)N. Addendum to Quarterly progress rept. no. 7, AD-253 923)
(Contract DA 36-039-sc-78050, Proj. 3-58-02-401)
Unclassified report

DESCRIPTORS: *Digital computers, *Data processing systems, Mobile, Mathematical computer data, *Memory devices, Data storage systems, Remote control systems, Armies, Military equipment, Electronic circuits, Design.

This addendum contains descriptions of three mechanized instructions (multiply, multiply and round, shift left long) and their mechanization, a description of the mass memory and mass memory control unit (including the mass memory address register), and a description of the mass memory controls in the van and in the remote truck. (Author)

AD-256 163 Div. 30
(22 May 61) OTS price $2.60

Geophysics Corp. of America, Bedford, Mass.
A HIGH VACUUM GAUGE CALIBRATION SYSTEM,
by Wallace S. Kreisman. 17 Nov 60, 27p. incl. illus. tables. (GCA Technical rept. no. 60-2)
(Contract NAS5-270)
Unclassified report

DESCRIPTORS: *Pressure gages, Calibration, *Vacuum systems, Standards, *Manometers, Mercury, Pressure, Measurement, Design, Low pressure research, Tests.

An ultra-high vacuum type metal and glass system was constructed for the purpose of calibrating vacuum gauges in the pressure region from 760 to 10 to the -7th power torr. The high vacuum portion of the system is bakeable at temperatures up to 450 C. A mercury manometer serves as a pressure standard in the region from 760 to 20 torr, and three specially designed, bakeable McLeod gauges with overlapping pressure ranges serve as pressure standards in the region from 20 torr to 1 x 1/10,000 torr. Theoretical accuracies of 1 percent or better are expected for the McLeod gauge readings in this pressure region. Pressures from 1 x 1/10,000 torr to 10 to the -7th power torr region can be measured, but the accuracy of the readings depends on adsorption and outgassing effects. Results pertaining to the reproducibility of measurements and comparisons of various gauge readings are presented. A pressure rise measurement technique is used to determine how the vacuum gauges and other system components are behaving. (Author)

AD-256 191 Div. 30, 6, 25
(18 May 61) OTS price $1.60

Aerospace Technical Intelligence Center, Wright-Patterson Air Force Base, Ohio.
DETECTION DEVICE BY MEANS OF THERMOELECTRIC COUPLES.
2 Nov 60, 11p. incl. illus. (Trans. no. MCL-732 from French patent, pp. 4, 27 Aug 53)
Unclassified report

DESCRIPTORS: Thermoelectricity, Detectors, Design, *Thermocouples, Soldered joints, Thermal insulation, Galvanometers, France, Patents.

The invention pertains especially to the characteristics below and to their various possible combinations: Detector containing thermo-electric couples mounted on an insulating support; the ends of each adjacent thermo-electric couple run into one and the same cell. The detector is characterized in that the ends of each couple running into a cell, are soldered with tin in such a way that the soldering fills said cell; this arrangement makes it possible to obtain perfect solders, to have a plane surface, and to assure complete tightness of the lodging which receives the ends of each thermo-electric couple. (Author)

AD-256 205 Div. 30, 2, 8
(18 May 61) OTS price $8.10

Scientific and Process Instruments Div., Beckman Instruments, Inc., Fullerton, Calif.
MEASURING SET, DEWPOINT AN/AMQ-14(XH-1). ITEM V.
Final engineering rept. Apr 61, 79p. incl. illus. table.
(Contract AF 33(600)30790)
Unclassified report

DESCRIPTORS: *Hygrometers, *Dew point, Measurement, Airborne, Transistors, *Electronic circuits, *Water vapor, Absorption, *Infrared radiation, *Infrared optical systems, *Humidity, *Optical filters, Infrared filters, Analog computers, Design, Temperature, *Band-pass filters, Circuits, Servo systems, Vapor pressure.

Data are presented on the construction of an airborne hygrometer. The basic measurement of the instrument is the radiation absorption in an infrared wavelength region of high water vapor absorption as compared to that of a nearby reference wavelength of negligible water or other contaminant absorption. The optical null measure of absorption is converted and corrected in an analog computer first to a measure of total water, equivalent to vapor pressure, then an output reading of outside dew point temperature. (Author)

AD-256 258 Div. 30, 5, 8, 28
(19 May 61) OTS price $12.50

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
INVESTIGATION AND EVALUATION OF THE GEL SPEECH SYSTEM TEST SET,
by D. W. Robertson and C. W. Stuckey. Final technical rept. for Item 1 on Proj. no. A-483. 28 Feb 61, 158p. incl. illus. tables, 25 refs.
(Contract AF 30(602)2150)
(RADC TR 61-88) Unclassified report

DESCRIPTORS: *Speech, Intelligibility, Interference, *Test sets, *Learning, *Voice communication systems, Radio interference, *Speech transmission, Signal-to-noise ratio, Tests, *Radio communication systems, Radio interference analyzers, Band pass filters, Radio reception, Noise (Radio), Statistical analysis, Training, Information theory.

Mathematical models of the articulation scores of an untrained and a fully trained team of listeners were developed. The maximum variance of the trained team was found, and the precision

of the results was computed. An investigation was made of the GEL Speech System Test Set's capability for providing a measure of the degradation in intelligibility that occurs when a voice signal is passed through a noisy speech-communication channel. The test set's measure of intelligibility was compared with that of a trained articulation team, and calibration curves were established for a variety of interference conditions. The validity of the test set design principle was verified for particular interference types, and the ability of the test set to perform in accordance with that design principle was determined. The inherent test set limitations are briefly discussed, and the possible extension of the test set's capability for ranking communication systems for other interference conditions is summarized. (Author)

AD-256 263 Div. 30, 6
(19 May 61) OTS price $1.60

Hallicrafters Co., Chicago, Ill.
HANDBOOK OF INSTRUCTIONS FOR TEST SET, ELECTRICAL POWER QRC-133A(T).
10 May 61, 22p. incl. illus. tables.
(Contract AF 33(604)21206)
Unclassified report

DESCRIPTORS: Handbooks, *Instruction manuals, *Test sets, *Radar jamming, Radar equipment, Voltmeters, Test equipment, Power supplies, Maintenance equipment, Calibration, Operation, Maintenance.

Operation and maintenance instructions are presented for test set, electrical power QRC-133A(T). The test set was developed to enable maintenance personnel to monitor simultaneously, the voltage and current inputs of barrage jammer QRC-133A(T). The test set electronically consists of eight three-and-one half inch round flange (flush mounting) panel-type, electrical indicating meters (four voltmeters and four current meters) which are used to monitor primary input power of the QRC-133A(T) system, switching circuitry which permits testing the DC input under low and high load conditions, and properly rated fuses that protect the primary power input lines of the test set. (Author)

AD-256 264 Div. 30, 6
(19 May 61) OTS price $2.60

Hallicrafters Co., Chicago, Ill.
HANDBOOK OF INSTRUCTIONS FOR TEST SET, DIODE SEMICONDUCTOR DEVICE QRC-133A(T).
10 May 61, 24p. incl. illus. tables.
(Contract AF 33(604)21206)
Unclassified report

DESCRIPTORS: Handbooks, *Instruction manuals, *Test sets, *Radar jamming, Radar equipment, Test equipment, Maintenance equipment, Diodes, Semiconductors, Oscilloscopes, Operation, Maintenance.

Operation and maintenance instructions are presented for test set, diode semiconductor device QRC-133A(T). The test set was developed to enable maintenance personnel to test the forward and inverse voltage/current characteristics of diode semiconductor devices. The test set electronically consists of a power transformer with a 115-VAC primary winding and two secondary windings. Also incorporated are: (1) a variable transformer that permits increasing or decreasing the diode test voltage, (2) switching circuitry that permits testing diodes with a maximum current handling capability of 1.0 ampere or 10 amperes, (3) a switch that orients the diode for forward or reverse test conditions, (4) a power ON-OFF switch, and (5) an interlock switch that prevents the application of test voltage unless the diode compartment cover is closed. (Author)

AD-256 333 Div. 30, 15
(22 May 61) OTS price $2.60

Case Inst. of Tech., Cleveland, Ohio.
A SORTING PROBLEM,
by R. C. Bose and E. J. Nelson. Apr 61, 22p. incl. table. (Case computing center pub. no. 1043)
(Contract AF 49(638)971; In cooperation with North Carolina U., Contract AF 49(638)213)
(AFOSR-636) Unclassified report

DESCRIPTORS: *Digital computers, Mathematics, *Combinatorial analysis, Data storage systems, *Programming, Coding, Data processing systems, Operators (Mathematics), Sequences.

A low upper bound is established for the number of comparisons required to sort n objects under the condition that the number of permutations be no larger than the number of comparisons. (Author)

AD-256 355 Div. 30, 32
(23 May 61) OTS price $9.10

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
MACHINE TRANSLATION STUDIES OF SEMANTIC TECHNIQUES.
Final rept. 22 Feb 61, 1v. incl. illus. tables
(Rept. no. C72-1U7)
(Contract AF 30(602)2036)
(RADC TR 61-72) Unclassified report

DESCRIPTORS: *Machine translation, Coding, Language, USSR.

AD-256 371 Div. 30, 28
(22 May 61) OTS price $5.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
DIVISION 5. INFORMATION PROCESSING.
Quarterly progress rept. 1 Dec 60-28 Feb 61, 15 Mar 61, 47p. incl. illus. tables.
(Contract AF 19(604)7400)
(AFCCDD TN61-1006) Unclassified report

DESCRIPTORS: *Data processing systems, Design, *Digital computers, Magnetic materials, *Computers, Learning, Psychology, Theory, Programming, Memory devices, Circuits.

AD-256 375 Div. 30, 5
(19 May 61) OTS price $1.60

Miglo Electronic Corp., Miami, Fla.
COMPUTER ACQUISITION SYSTEM, MODEL 1591.
Mar 61, 12p.
(Contract AF 08(635)1450)
(APGC TR 61-29) Unclassified report

DESCRIPTORS: *Data processing systems, *Data transmission systems, *Data storage systems, Computers, *Telephone communication systems, Test equipment, Maintenance, Reliability, Programming, Tests.

The Model 1591 Computer Acquisition System (CASY) accepts data in the form of three parallel words (X, Y, and H) from either a Remington Rand 1103A of IBM 7090 Computer. Upon completion of the data acquisition the data is transmitted in serial form over telephone voice lines in a format compatible with a NEC Model 1522-R Data Receiver. The CASY is capable, with manual programming, of various modes of operation with either computer. Internally generated test inputs along with visual indicators allow self-checking of the system with a minimum of effort and external equipment. When not operating in conjunction with a computer, noninterference with external equipment is assured. Modular type of construction allows extreme versatility and ease of maintenance. (Author)

AD-256 401 Div. 30, 10
(22 May 61) OTS price $3.60

Pennsylvania State U., University Park.
SHOCK TUBES IN FUELS RESEARCH,
by Howard B. Palmer. Apr 61, 26p. illus. 64 refs. (Proj. Squid TR no. PSU-8-P; Contract Nonr-185825, Proj. NR-098-038)
Unclassified report

DESCRIPTORS: *Shock tubes, *Fuels, Aviation fuels, Rocket fuels, Liquid rocket propellants, Solid rocket propellants, Explosives, Rocket oxidizers, Combustion, Chemical reactions, Decomposition, Test equipment, Pyrolysis, Laboratory equipment, Instrumentation, Oxidizers, Ignition, Jet engine fuels, Gases, Reaction kinetics, Hydrocarbons, Relaxation time.

A review is presented of the basic concepts as well as the past and present uses of the shock tube in the study of fuels. The use of shock tubes in the following studies is described: (1) pyrolysis of gaseous hydrocarbons and other gaseous fuels; (2) pyrolysis of oxidizers; (3) gaseous combustion reactions; (4) ignition lags of liquid fuel sprays; (5) gaseous oxidation and ignition behavior of solid fuels; and (6) vibration relaxation rates of fast chemical reactions.

AD-256 737 Div. 30, 15
(2 June 61) OTS price $2.60

Columbia U. School of Engineering, New York
COMPUTATION IN THE PRESENCE OF NOISE,
by Leo Bluestein. 1 Apr 61, 25p. incl. illus. tables. (Rept. no. CU-13-61-Nonr-266(60)EE; Technical rept. no. 65)
(Contract Nonr-26660)
Unclassified report

DESCRIPTORS: Differential equations, Errors, *Mathematical computer data, Difference equations, *Computers, Noise, *Signal-to-noise ratio, Information theory, Numerical methods and procedures, Analysis.

Two approximate methods are presented for analyzing the effect of noise on computer solutions of differential equations. The computer's operation is assumed to be governed by a difference equation; the input message is assumed to be an additive mixture of a random signal and the undesired noise. It is shown that a bound may be placed on the effect of this additive noise and, because this bound satisfies a linear time-invariant difference equation, the stochastic properties of this bound are easily found. The alternate method considers the noise as a small random perturbation of the signal. A linear, time-varying difference equation with random parameters describing the effect of the noise is then obtained. It is shown that both techniques require less computational labor and information about the random properties of the signal and noise than do conventional methods. (Author)

AD-256 769 Div. 30, 4
(31 May 61) OTS price $2.60

University of Southern Calif. Engineering Center, Los Angeles.
EXPERIMENTS IN CRYOPUMPING CO2,
by Raymond W. Moore, Jr. Mar 61, 16p. incl. illus. (Rept. no. USCEC 83-205)
(Contract AF 49-(638)831)
(AFOSR-561)
Unclassified report

DESCRIPTORS: *Cryogenics, *Carbon dioxide, Low temperature research, *Vacuum pumps, Gas flow, Pumps, *Solidified gases, Freezing, Condensation.

Experiments in cryopumping CO2 in a 3-in.-diam by 12-in.-long glass tube were carried out to observe the relationship between the flow rate and the pressure, the formation of the deposit on the condenser and the effects of noncondensables. A steady flow of CO2 gas was cryopumped by a condenser cooled to liquid N temperatures. Noncondensable gases (presumably air) in the tube exerted a strong and by far the predominant influence on the pressure upstream of the condenser and on the nature of the deposit. With tube pressures in the range of 0.005 to 0.5 mm Hg, the flow of CO2, from the inlet at one end of the tube to the condenser at the other end, swept the noncondensables downstream causing them to accumulate near the condensing surface. For certain condenser geometries this phenomena caused all or parts of the condenser surface to be blanketed by a noncondensable gas layer through which the condensing gases must diffuse. In some cases the presence of this gas layer caused a considerable increase in the pressure upstream of the condenser. The noncondensable gases were apparently introduced as impurities in the CO2 and entered the tube along with it. Consequently, when no attempt was made to continuously remove them, the pressure in the tube steadily rose. If any trapping of noncondensables by the condensate occurred, its rate was too small to be observed. (Author)

AD-256 770 Div. 30, 5, 12
(31 May 61) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
A DIGITAL RECORDING SYSTEM FOR SATELLITE TRACKING DATA,
by Thomas P. Sifferlen and William M. Hocking. May 61, 23p. incl. illus. tables. (NASA Technical note no. D-672)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note no. D-672.

DESCRIPTORS: *Satellite vehicles, *Tracking, Data transmission systems, Digital systems, Telemetering receivers, Telemetering data, Data processing systems, *Digital recording systems, Satellite vehicle trajectories, Teletype systems, Telemetering antennas.

A digital recording system was designed and built for recording satellite tracking data, as received by the Minitrack System, on five-level punched paper tape at a rate of 100 characters per second. The tape from the digital recording system provides satellite direction cosine information, time, and date. The punch code is identical with that used in teletypewriter communication and is used to transmit the data via NASA communications circuits to the IBM 7090 computer for determining orbital elements. (Author)

AD-256 813 Div. 30, 8
(31 May 61) OTS price $17.50

Armour Research Foundation, Chicago, Ill.
INSTRUMENTATION AND MEASUREMENT TECHNIQUES STUDY.
by R. P. Schuck. Quarterly progress rept. no. 8, 1 Feb 59-31 Jan 60. 31 Jan 60, 1v. incl. illus. tables. (Rept. no. ARF 5112-Q8)
(Contract DA 36-039-sc-78269)
Unclassified report

DESCRIPTORS: *Electrical equipment, Test equipment, Measurement, Instrumentation, *Electronic equipment, Military equipment, *Test sets, Phase detectors, Power meters, Radiofrequency spectrum analyzers, Microwave amplifiers, Audiofrequency, Modulators, Frequency converters, Difference equations, Cerenkov radiation.

Research was concerned with advancing the state of the art of electrical measurements. Efforts were devoted to the analysis, construction, and testing of a Hall-effect audio frequency wattmeter, Hall-effect microwave wattmeters operating at X-band, a Hall-effect intermodulation distortion measurement meter, angle and phasing-type SSB modulators employing voltage-variable diode capacitors, a magnetoresistive attenuator employed in a stripline configuration, a magnetoresistive oscillator, a Hall-effect signal attenuator, SSB, phase, and frequency modulators employing the Hall effect, a traveling wave parametric amplifier, a Hall-effect frequency converter, and an intermediate frequency rms voltmeter employing the Hall effect. Investigations were also made concerning the circuit applications of a sheet-beam deflection tube, applications of a commercial Hall device, electric field sensors, digital control of frequency, and a study of transition radiation and Cerenkov radiation. (Author)

AD-256 890 Div. 30, 8
(2 June 61) OTS price $8.60

Digital Computer Lab., U. of Illinois, Urbana.
FLOW-GATING,
by Henry Guckel, Toshiro Kunihiro, and Ronald K. Crow. Final rept. 24 Mar 61, 1v. incl. illus. tables (Rept. no. 106)
(Contract Nonr-1834(15))
Unclassified report

DESCRIPTORS: *Digital computers, Feedback, *Electronic circuits, *Transistors, Data storage systems, Triggered gates, Coding, Triggering circuits, Electrical properties, Memory devices.

Work concerns transistor selection and evaluation, the basic design problem, and the evaluation of the flow-gating memory. The proposed system consists of 14 flow-gating flipflops, which constitute a 1/4 word (3 transistors per bit), the read-in driver (18/14 transistors per bit), the read-out driver (10/14 transistors per bit), and termination equipment (2/11 transistors per bit). The system uses five transistors per bit of which 12/14 are GF45011, 40/77 are N-101 and the remaining parts are of the N-100 type. The terminal properties are given. The AC behavior is discussed in considerable detail. The read-in speed, after tolerance correction, is less than 90 nsec.; the read-out speed is in the vicinity of 80 nsec., when referenced to the input of the respective drivers. This apparently satisfies the proposed requirement of 150 nsec. access times. (Author)

AD-256 895 Div. 30, 25
(2 June 61) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
PYROELECTRIC TRANSDUCERS FOR HEAT-TRANSFER MEASUREMENTS,
by T. A. Perls and J. J. Hartog. Technical rept. on Physics, Physical Electronics. May 61, 19p. incl. illus. (Rept. no. LMSD-325500)
Unclassified report

DESCRIPTORS: *Temperature sensitive elements, *Heat transfer, Temperature, Measurement, *Transducers, Ceramic materials, Titanates, Polarization, Piezoelectric materials, Piezoelectric gages, Piezoelectric transducers, Lead compounds, Zirconates, Barium compounds.

The state of the art for heat-transfer measurements is briefly reviewed. It is shown that heat-transfer rate may be measured with extremely short response times by the use of a variety of temperature-sensing devices followed by a simple electrical differentiator. Theoretical considerations are presented for pyroelectric ceramic transducers, and it is shown that these sensors constitute a particularly simple type of temperature-measuring device with differentiation. Evaluation and calibration procedures, applications, advantages, limitations, as well as typical circuitry and installations are discussed. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-256 380 Div. 31, 18
(19 May 61) OTS price $2.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
PROPULSION UNIT MOUNTINGS FOR 3- X 15-PONTOON CAUSEWAY SECTIONS,
by J. E. Smith. Final rept. 17 Apr 61, 28p. incl. illus. (Technical rept. no. 139)
(Proj. Y-F015-11-317)
Unclassified report

DESCRIPTORS: *Floats, Barges, Design, Tests, Launching, Structures, Ballast, *Marine engines, Vulnerability, *Mounting brackets,

Installation, Propulsion, Amphibious operations, Portable bridges, Naval equipment.

An investigation was conducted to determine the possibility of developing a special type of mounting that would permit propulsion units to be placed on 3- x 15-pontoon causeway sections. The mounting would provide a means for moving the units clear of the end-to-end connection so that the sections may be used as barges as well as causeways, thus eliminating the need for tender craft and the additional expense and utilization of critical shipping space attendant with their use. Two different prototype mountings were fabricated and tested. Neither design was successful because the causeway sections could not be connected without the aid of tender craft. It was concluded from this and other unfavorable operational factors that development of a special propulsion unit mounting for the intended purpose is not feasible. (Author)

AD-256 541 Div. 31, 6, 9
(24 May 61) OTS price $2.60

David Taylor Model Basin, Washington, D. C.
THE HYDRODYNAMIC DESIGN OF A CABLE-TOWED BODY SUITABLE FOR ECONOMICAL PRODUCTIONS,
by Shelton M. Gay, Jr. Dec 59, 23p. incl. illus. tables, 13 refs. (Rept. no. 1389)
Unclassified report

DESCRIPTORS: *Towed bodies, *Hydrodynamics, Design, *Sonar, Sonar domes, Towing cables, Production, Underwater sound, Calibration, Model tests, Configuration.

The hydrodynamic design of a specific cable-towed body suitable for economical production is presented. The general hydrodynamic requirements are listed and the design approach is described. Basin tests of a prototype body indicate that the design requirements were satisfactorily achieved. (Author)

AD-256 860 Div. 31, 8
(31 May 61) OTS price $1.60

Naval Boiler and Turbine Lab., Philadelphia, Pa.
RADAR AIR SUPPLY - DETERMINATION OF LEAKAGE RATES,
by V. T. Vasko. 5 May 61. 10p. incl. table.
(NBTL Proj. no. A-335)
Unclassified report

DESCRIPTORS: *Radar equipment, Shipborne, *Waveguides, *Cruisers, *Search radar, Air, Pressure, Moisture, Reduction, *Radar tracking.

Air leakage from pressurized radar waveguide systems installed on the guided missile cruisers Galveston (CLG-3) and Little Rock (CLG-4) was measured to obtain valid criteria for the design of a central dry air supply system, proposed as a replacement for existing individual radar system dry air supply units. The radar systems tested included the SPG-49, SPW-2, AN/SPS-2, AN/SPS-8, AN/SPS-17, and AN/SPS-42. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

AD-256 219 Div. 32
(18 May 61) OTS price $4.60

National Research Council, Washington, D. C.
THE MANUFACTURING ECONOMY OF SOUTHERN RHODESIA: PROBLEMS AND PROSPECTS,
by Leonard Tow. 1960, 141p. incl. illus. tables, 120 refs. (Foreign Field Research Program rept. no. 10; NAS-NRC publication no. 850)
(Contract Nonr-230009)
Unclassified report

DESCRIPTORS: *Economics, *Industry, Industrial plants, *Economic conditions, Fuels, Labor, Agriculture, Minerals, Transportation, Power supplies, South Africa.

Contents:
Economic growth and manufacturing
Fuel and power
Mineral and agricultural raw materials
Transportation facilities
The human resources of Southern Rhodesia
Markets
Capital resources and investment determinants
The industrial prospects

AD-256 379 Div. 32, 15
(25 May 61) OTS price $2.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ON THE PRICE ADJUSTMENT PROCESSES IN COMPETITIVE ECONOMIES,
by Ken-ichi Inada. 11 Apr 61, 21p. incl. illus. 14 refs. (Technical rept. no. 95)
(Contract Nonr-22550, Proj. NR 047-004)
Unclassified report

DESCRIPTORS: *Economics, *Costs, Mathematics, Differential equations, Statistical analysis.

The economic implications of some representative price adjustment processes are discussed. The processes are classified as normalized process and non-normalized process. In the former process there is a numeraire commodity and its price is fixed as one throughout the adjustment process. In the latter process there is no numeraire commodity and all commodities are treated symmetrically. The two types of price adjustment processes have essentially different economic implications. (Author)

AD-256 454 Div. 32, 2
(24 May 61) OTS price $2.60

Columbia U., New York.
CABINDA ENCLAVE, ANGOLA: ITS ECONOMY AND SHIPPING POINTS,
by Irene S. van Dongen. 1960, 13p. illus. tables. (Technical rept. Cu 16-61-Nonr 266(29) Geog.)
(Contract Nonr-26629, Proj. NR 388-022)
Unclassified report

DESCRIPTORS: *Angola, Africa, History, *Congo, Transportation, Economic conditions, *Forestry, Shipping, Tropical regions.

Markedly increased exploitation of the tropical timber resources has been a significant feature of postwar economic development in Western Africa. With increasing demand and wider acceptance of various species in the world markets, other western African areas turned more actively to logging and some of their ports became important as shippers of tropical timber. The Cabinda Enclave is one such area. That little-known part of Africa to the north of the Congo Estuary lies separated from the main body of Angola and is wedged in between two new republics of the Congo Basin: Congo (Brazzaville), until 1958 the Middle Congo territory of French Equatorial Africa, and Congo (Leopoldville), until 1960 the Belgian

Congo. The Enclave ha[illegible] land area of only 2,794 square miles, or [illegible]6 per cent of the total for Angola, and a popul[illegible]ion of about 50,000 or 1.2 per cent of Angola's total. Other commercial production of the Enclave includes robusta coffee, cacao, and oil and kernels from the abundant stands of wild elaeis palm. (Author)

AD-256 469 Div. 32, 30
(23 May 61) OTS price $8.60

ANelex Corp., Boston, Mass.
MACHINE LANGUAGE TRANSLATION DEVICES SYSTEM.
Quarterly progress rept. no. 6, 1 Oct 59-13 Nov 60. 13 Nov 60. 1v. incl. illus.
(Contract DA 36-039-sc-78123)
Unclassified report

DESCRIPTORS: *Machine translation, Computers, Design, *Data processing systems, *Data storage systems, Coding, Language.

AD-256 523 Div. 32, 15
(22 May 61) OTS price $3.60

Princeton U., N. J.
THE COST-OF-LIVING INDEX: COMBINATORIAL THEORY, by S. N. Afriat. 10 Apr 61. 27p. (Research memo. no. 27)
(Contract Nonr-185816)
Unclassified report

DESCRIPTORS: *Costs, *Economics, Combinatorial analysis, *Statistical analysis, Mathematics.

The evaluation is considered of the range for a cost-of-living index which is compatible with given expenditure data. The method for solution of the index-number problem gives the means of establishing the range of any characteristics of a normal preference scale admitted by given expenditure data; for example, an equilibrium on a balance constraint, an elasticity, properties such as substitutability, complementarity, decomposability, and so forth, with every concept which depends on preferences in consumer theory. It should be possible to give all such concepts a precise meaning in terms of a finite scheme of expenditure data. With that done, fitting instruments would be available for the empirical investigation of consumer behaviour, so far as that behaviour can be grasped systematically in direct terms of the classical framework. An empirical preference structure must be somewhat loosely characterized, in view of the fragmentary character of the empirical data. The present method seems entirely appropriate in that requirement since it precisely represents the very vagueness of preferences. (Author)

AD-256 665 Div. 32
(26 May 61) OTS price $4.60

Rand Corp. Santa Monica, Calif.
A SELECTED LIST OF UNCLASSIFIED PUBLICATIONS OF THE SOCIAL SCIENCE DEPARTMENT 1948-1961 THE RAND CORPORATION.
15 Mar 61. 43p. 245 refs. (Research memo. no. RM-1403-7)
(Contract AF 49(638)700)
Unclassified report

DESCRIPTORS: *Bibliography, *Social sciences, Political science, USSR, Foreign policy, Leadership, Communism, Industry, Warfare, Psychological warfare, Military organizations, Weapons.

AD-256 872 Div. 32
(1 June 61) OTS price $6.60

Rand Corp., Santa Monica, Calif.
THE KHRUSHCHEV SUCCESSION PROBLEM, by Myron Rush. 1 May 61. 55p. (Research memo. no. RM-2763)
(Contract AF 49(638)700, Proj. Rand)
Unclassified report

DESCRIPTORS: *Political science, Economic conditions, Social sciences, Sociology, *USSR.

An assessment of the question of Soviet succession in Khrushchev's 68th year, the fourth year of his rule. The study indicates that a succession crisis is inevitable when Khrushchev ceases to exercise dictatorial powers. The depth of the crisis, however, will depend on certain circumstances at the time. Only if the Soviet regime is seriously weakened by such a crisis is it likely that Soviet foreign policy will be redirected from its primary aim of subverting the West and achieving a communist world order. Moreover, while economic and social progress poses a serious problem for the regime and is certain to have important political consequences, it cannot, in the author's view, change the regime's totalitarian character in the years ahead unless it is seriously weakened by a succession crisis. (Author)

33. TRANSPORTATION

No Entries

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

AGRICULTURE

PB 149 229 $8.10

California U., Berkeley.
THE VEGETATION OF ANTIGUA AND BARBUDA, LEEWARD ISLANDS, THE WEST INDIES, by David R. Harris. Rept. on Contract Nonr-222(11). 1960, 89p. 18 refs. AD-239 382.

DESCRIPTORS: *Leeward Islands, *Plants, Ecology, Atlantic Ocean, Geology, Terrain, *Caribbean Islands, *Trees.

Contents:
Physique and soils
Climate
The vegetation of Antigua
  Secondary forest of the volcanic district
  Scrub woodland of the limestone district
  Riparian and pond vegetation
  Grassland and thron thicket
  Cactus scrub
  Littoral vegetation
    Evergreen woodland
    Coastal grassland
    Manchineel groves
    Coconut groves
    Mangrove swamp
    Strand vegetation
The vegetation of Barbuda
  Vegetation of the highlands
  Vegetation of the marginal plain
    North of Codrington
    South of Codrington
Littoral vegetation

ASTRONOMY

Astrophysics

PB 171 812 $0.50

California U., Los Angeles.
ASTRODYNAMICAL NOTATION AND USAGE, by Samuel Herrick, Maud W. Makemson, and Mary P. Francis. Rept. on Contract AF 49(638)498. 15 July 60, 19p. Astrodynamical rept. no. 10; AFOSR-TN-60-856; AD-250 760.

DESCRIPTORS: Standards, Documentation, *Dictionaries, Classification, *Astronautics.

PB 171 813 $0.75

Lockheed Aircraft Corp., Sunnyvale, Calif.
CATALOG OF RADIO OBSERVATORIES, by C. R. Moe. Technical memo. on Physical Electronics. July 60, 23p. LMSD-703079; AD-246 550.

DESCRIPTORS: Catalogs, *Radio astronomy, Noise (Radio), Solar noise, Solar corona, Extraterrestrial radio waves, Radio interference.

A list of radio observatories was compiled as a part of the LMSD radio astronomy program and several other programs. It covers known radio astronomy and polar noise study installations and the supplement lists some space track installations exclusive of the minitrack and dark satellite fences. This material was compiled primarily from a similar listing and a listing of solar noise observatories; however, these were compiled in 1957 and 1958 and required some revision. Added material came from the Soviet Bloc IGY-IGC publications. Aviation Week, Space Aeronautics, Missiles and Rockets, and various other publications. (Author)

PB 155 455 $4.60

Stanford Electronics Labs., Stanford U., Calif.
METEOR RATE AND RADIANT STUDIES. Final rept. 1 Mar 57-30 Nov 60, on Contract AF 19(604)2193. 30 Dec 60, 46p. 16 refs. AFCRL-127; AD-253 252.

DESCRIPTORS: *Radio astronomy, Astronomical data, Meteors, Sun, Moon, Radar reflections, Radio waves, High frequency, *Radio communication systems, Instrumentation, Electronic equipment.

An analysis is made which can be divided into two categories: (1) Radio and radar studies of meteoric ionization, in the following areas: (a) Meteor rate and radiant distributions with applications to the improvement of long-range communications by meteor-burst and meteor-scatter modes, (b) Determination of certain optimum system parameters for use in oblique propagation by meteor-scatter and meteor-burst modes, and (c) Measurements of meteoric ionization from extremely small (15th Magnitude) meteors, aimed toward the study of astronomical properties; and (2) Radar astronomy, specifically studies of the sun, moon, and interplanetary gases, including (a) Detection of radar echoes from the sun's corona, (b) Studies of the cis-lunar ionized gas using radar echoes from the moon, (c) Study of the lunar surface based upon properties of reflected radio waves, and (d) Theoretical investigations of incoherent scattering of radio waves by individual electrons. (Author)

BEHAVIORAL SCIENCES

Human Engineering

PB 156 124 $7.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
HUMAN FACTOR ENGINEERING, by William J. White and Solomon Schneyer. Pocket data book. Rept. on Subcontract to Hoffman Electronics Corp., Contract AF 33(604)17231. [1958] 72p. 9 refs. Rept. no. UB-1227-V-3.

DESCRIPTORS: *Human engineering, *Handbooks, Electronic systems, Design.

The book is to provide the designer of the AN/ULD-1 system with basic human engineering data and established design recommendations for maximizing the efficiency of man-machine systems.

PB 153 761 $1.60

Biotechnology Lab., U. of California, Los Angeles. ARM PROSTHESIS RESEARCH. OBSERVER PRACTICE. HUMAN TRACKING, by John Lyman. Progress rept. on Contracts V1005M-2075, Nonr-233(49) and AF 33(616)5402. 15 Mar 60, 16p. Research rept. 60-23; AD-236 279.

DESCRIPTORS: *Prosthetics, *Artificial limbs, Muscles, Training, Physiology, Heat tolerance, Psychomotor tests, Design, Visual perception, Test methods, *Arms.

Contents:
Fundamental studies to establish body control sites for application to externally powered prostheses
Electromyographic studies
Surgical nerve replants
Functional isolation of muscle groups by training
Physiological measurements of human thermal tolerance
Engineering analysis of biotechnical factors in control systems
Kinetic and kinematic analyses of prostheses control motions
Sequential analyses of time-separated prosthesis control functions
Selected prostheses application studies
Double pectoral tunnel
Transmetacarpal amputation
Prostheses for the severely handicapped
Sensory-motor control and feedback investigations
Control engineering state-of-the-art survey
Methods development and special design investigations
Effectiveness of elimination of displayed information with observer practice increase
Interaction of display redundancy and display complexity during training
Determination of a hierarchy of perceptual usefulness of geometrical cues in dial reading tasks
Development of a rationale for psychomotor tests measuring performance decrements in extreme environments
(See also PB 149 444)

Personnel and Training

PB 149 900* $9.10

Applied Psychological Services, Wayne, Pa. POST-TRAINING PERFORMANCE CRITERION DEVELOPMENT AND APPLICATION: DEVELOPMENT AND APPLICATION OF A TBCL CRITERION TO THE SESR PROGRAM FOR AVIATION ELECTRONICS TECHNICIANS, by Milton Richlin, Arthur I. Siegel, and Douglas G. Schultz. Rept. on Contract Nonr 2279(00). July 60, 104p. 4 refs. AD-243 972.

DESCRIPTORS: Training, Tests, Naval aviation, *Maintenance personnel, Electronic equipment, *Military training, *Attitudes, Statistical analysis, Test methods, *Naval personnel, *Aptitude tests, Effectiveness.

A list of tasks performed by aviation electronics technicians (radar) (ATR's) during their first year in the fleet was developed and submitted to the supervisors of 83 aviation electronics technician strikers who had been trained under a previous general program. The scores of the Selective Emergency Service Rate (SESR) Program trained technicians were compared with the scores of the generally trained technicians for 54 selected tasks. The results indicated that: (1) during their first 9 mo in the fleet, the performance of aviation electronics technicians trained under the SESR Program was equal to, and probably superior to, the performance of aviation electronics technicians trained under the pre-SESR program, especially in pre-flight inspection tasks; (2) the pre-SESR and SESR trained technicians were both performing well in the fleet; however, during the first 9 mo, few strikers were assigned to tasks involving operation of equipment; (3) both groups showed improvement in performance from the first 3 mo to the fourth through ninth months in the fleet; (4) the Scaled Technical Proficiency Check List (STPCL) and the Scaled Technical Difficulty Check List (STDCL) appear to measure the different functions from the Technical Behavior Check List (TBCL); and (5) TBCL scores for aviation electronics technicians are not related to basic battery test scores or A school grades. (Author)

PB 154 134 $4.60

Bureau of Naval Personnel, Washington, D. C. TRAINING AND PROFICIENCY OF AVIATION ELECTRONICS TECHNICIANS. I. THE PROFICIENCY OF RECENT CLASS "A" SCHOOL GRADUATES, by Earl I. Jones and Alvin J. Abrams. Sep 60, 43p. 8 refs. Technical Bulletin 60-7; AD-249 330.

DESCRIPTORS: *Aviation personnel, *Maintenance personnel, *Training, *Military training, Effectiveness, Test equipment, Operation, Soldering, *Achievement tests, Design, Psychometrics, Test methods, Electronic equipment, Sonar equipment.

During the period July through November 1959, sixty-one men reporting for their first assignments after graduating from Aviation Electronics Technician (AT) A Schools were tested on their proficiency in use of test equipment, soldering, trouble shooting procedures, and publications. Additionally, a sample of 44 fleet-experienced AT's was tested on use of test equipment and soldering. Results indicated that the majority of the Class A AT school graduates had mastered the fundamental skills with which training was concerned. Exceptions to this general finding may be noted in the tables of the report. (Author)

PB 154 135 $3.60

Bureau of Naval Personnel, Washington, D. C. TRAINING AND PROFICIENCY OF AVIATION STRUCTURAL MECHANICS. I. PROFICIENCY OF RECENT ASM SCHOOL GRADUATES, by Earl I. Jones and Alvin J. Abrams. Sep 60, 33p. 2 refs. Technical Bulletin 60-10; AD-249 331.

DESCRIPTORS: *Aviation personnel, *Maintenance personnel, *Training, *Military training, Effectiveness, *Achievement tests, Design, Psychometrics, Test methods, Machine shop practice, Machine tools, Operation.

Twenty-seven graduates of the Class A Aviation Structural Mechanic (AMS) course who were reporting for their first post-school assignment were performance-tested between July and November 1959. The purpose of the tests was to provide descriptive information on the graduates' proficiency in fundamental areas of training. The tests enabled observation of graduates' performance in the following areas: interpretation of shop drawings, shop computations, cutting and forming, selection of materials and preparation for riveting, riveting, welding, and cutting with a torch. Test results lead to the general conclusion that most AMS's have mastered a majority of the fundamental skills upon which they were observed. (Author)

PB 154 136 $3.60

Bureau of Naval Personnel, Washington, D. C.
THE TRAINING AND UTILIZATION OF SONARMEN ASSIGNED TO SUBMARINE FORCE UNITED STATES PACIFIC FLEET, by Adolph V. Anderson and Edward J. Pickering. Sep 60, 43p. 4 refs. Technical Bulletin 60-12; AD-249 332.

DESCRIPTORS: *Naval personnel, *Submarine personnel, *Sonar personnel, *Military training, *Training, Sonar, Maintenance, Operation, Test methods, Job analysis, Effectiveness.

A survey of the utilization and training of submarine sonarmen was conducted on board twenty randomly selected Pacific Fleet submarines as part of a general sonarman survey. Results of the survey are interpreted to indicate that submarine sonar skills are applied extensively in the Fleet, and that operational aspects of sonar training are adequately provided for, but that more intensive training in sonar maintenance would be appropriate. (Author)

PB 149 843 $2.60

Clifton Corp., Washington, D. C.
AN ANALYSIS OF WORK PATTERNS OF CIC PERSONNEL FOR CVA-59 CLASS SHIPS, by Ernest J. McCormick and Ronald H. Asquith. Supplementary rept. of research on Contract Nonr-2476(00). July 60, 23p. 8 refs. AD-241 169.

DESCRIPTORS: *Naval personnel, *Job analysis, *Officer personnel, Statistical analysis, Analysis of variance, Combat information centers, Group dynamics.

The study is limited to data obtained by diaries and is concerned with two specifics: (1) the degree to which work patterns of individuals are the same from day to day; and (2) the extent to which there are similarities or differences in the patterns of work activities between individuals within a work group for any given day. In addition to uncovering valuable information about work activity patterns of individuals, the study's findings support the conclusion of the basic study that for such activities as CIC a five-day diary provides reliable work measurement data. (Author)

PB 155 543 $1.10

Texas Christian U., Fort Worth.
ANALYSIS OF AC AND W HONOR SQUADRON PROFICIENCY SCORES, by S. B. Sells and Winton H. Manning. Rept. on Contract AF 41(657)323. Feb 61, 9p. AAL technical note AAL-TN-60-28; AD-253 714.

DESCRIPTORS: *Aviation personnel, Tests, *Factor analysis, Effectiveness, Measurement, Standards, Behavior, Military organizations.

The analysis of the proficiency rating system for AC and W sites suggests that these ratings are unstable, internally inconsistent, and that the relative importance of the several factors in the total point scores is quite different in actuality from that intended by the maximum points allowed. Only 6 of the 10 factors could be used, since the remaining 4 lacked range or were too incomplete for equitable inclusion. In view of these findings, the ratings cannot be used as criteria in the present research.

Psychology

PB 148 939 $1.10

Colorado U., Boulder
PERSONALITY CHARACTERISTICS ASSOCIATED WITH RESISTANCE TO CHANGE, by Carroll E. Izard. Technical rept. no. 2 on Contract Nonr-1147(07), continuation Contract Nonr-2149(02) with Vanderbilt U. (1960) 8p. 9 refs. AD-239 506

DESCRIPTORS: *Personality, *Attitudes, *Perception *Reasoning, *Personality tests, Behavior, Statistical analysis, Reaction (Psychology).

It was hypothesized that the personality characteristics of autonomy dominance, deference, and abasement, as measured by the personal preference schedule (PPS), would co-vary with change of concept under influence of E's instructions. The 39 Ss were first given the PPS. Ss were then taken individually to the laboratory where they were given the opportunity to form a concept of the distance between two stimulus lights exposed in a dark room. Following this, E gave instructions calculated to influence S to change his concept of the distance, although the actual distance remained the same. The PPS and laboratory behavior were both interpreted as essentially phenomenological, since S s own perceptions and feelings formed the frame of reference for response. The hypothesis was confirmed for three of the four personality characteristics at the .05 level of confidence. For the fourth, the correlation was in the right direction and P was between .10 and .05. This indicates that Ss PPS scores on autonomy and dominance correlated positively with resistance to change and that deference and abasement correlated negatively,

The implications of this finding for the validity of the PPS and for certain interpersonal interactions, including psychotherapy and counseling, were discussed briefly. (Author)

PB 148 940 $3.60

Colorado U., Boulder.
PERSONALITY CORRELATES OF CONCEPTUAL FUNCTIONING AND CHANGE ACROSS SITUATIONS, by O. J. Harvey. Technical rept. no. 3 on Contract Nonr-1147(07). [1959] 31p. 9 refs. AD-239 520.

DESCRIPTORS: *Personality, *Attitudes, Perception, *Personality tests, Reasoning, Test methods.

Personality correlates of concept functioning obtained from nine studies are described. The most consistent and important results were the correlations of authoritarianism to concept functioning. (Author)

PB 150 434 $4.60

Educational Testing Service, Princeton, N. J.
DETERMINATION OF GENERALIZED LEARNING CURVES BY FACTOR ANALYSIS, by Ledyard R. Tucker. Technical rept. on Mathematical Techniques in Psychology, Contract Nonr-1858(15) and National Science Foundation Grant G-3407. July 60, 46p. 14 refs. AD-245 522.

DESCRIPTORS: *Learning, *Factor analysis, Probability, Theory, Analysis of variance.

The problem of individual differences in learning functions is discussed for the situations when generalized learning curves are being sought. Mean learning curves are appropriate only for a limited class of special cases when the individual learning curves are linear transformations on the dependent variable from each other. A factor analytic procedure is described to develop generalized learning curves, or families of curves, for a much extended class of cases. This procedure is illustrated with some probability learning data. (Author)

PB 155 077 $6.60

Georgetown U. Medical Center, Washington, D. C.
SCORING MANUAL FOR A SENTENCE COMPLETION TEST OF HOSTILITY, AGGRESSION ANXIETY AND PROJECTION, by Herbert Zimmer. Rept. on Contract AF 49(638)487. Sep 59, 69p. AFOSR-TN-59-949; AD-227 059.

DESCRIPTORS: *Personality tests, Analysis, *Instruction manuals.

This test was developed as a research tool for the purpose of studying intrapersonal processes through the medium of hostility. It was constructed because it appeared that a similar instrument was not available. The measurement of 3 processes is attempted by means of the test: (a) the subject's direction and strength of hostility, (b) the extent of his aggression anxiety, and (c) his proclivity for projecting hostility. Nine items are devoted to the measurement of aggression anxiety, 12 to projection of hostility, and remaining 34 to measuring hostility per se. The last 34 items are divided into 3 categories, on the basis of the stimulus value of their sentence stems; 12 are labelled aggressing against, seven are ambipunitive, and 15 are called being aggressed against. Together they constitute the hostility group, and are scored and treated in an identical fashion. (Author)

PB 154 952 $2.60

Oslo U. (Norway).
THE TEMPORAL LOBE SUBSTRATE OF FEAR AND ANGER. A REVIEW OF RECENT STIMULATION AND ABLATION STUDIES IN ANIMAL AND HUMANS, by Holger Ursin. Rept. on Contract AF 61(514)1127. [1959] 27p. 81 refs. AFOSR-TN-59-994; AD-226 753.

DESCRIPTORS: *Brain, *Fear, Stimulation, Surgery, *Emotions, Physiology, Electroencephalography, Ablation, *Behavior.

A review is given of recent stimulation and ablation studies in animals and humans regarding the importance of temporal lobe structures for emotional behavior. In animals fear has been produced by stimulation of the temporal cortex and from a limited portion of the amygdala (anger from the amygdala only). The two types of emotional behavior patterns appear to be related to two separate subdivisions of the amygdaloid nuclear complex. The observations in humans, although as yet not conclusive, seem in the whole to be in agreement with the results from the animal experiments. (Author)

PB 149 981 $3.60

Princeton U., N. J.
GROUP DEVELOPMENT AND FUNCTIONING, by Harold M. Schroder. Technical rept. no. 7 on Contract Nonr-1858(12). July 60, 34p. 20 refs. AD-242 617.

DESCRIPTORS: *Group dynamics, *Behavior, Theory, Training, Learning, Attitudes, Effectiveness.

Whatever theory one uses to study group functioning, of the many relevant considerations, two are of particular importance: (1) the variables used to describe dispositional and situational effects including the nature of tasks should be systematically related so as to account for their interactive effects; and (2) the theory should have the potential to account for variations in functioning over time in a developmental context, so that meaningful comparisons between group observations can be made across different experiments. While the approach outline in this paper represents such an attempt, it suffers from a lack of specificity due to the paucity of relevant research at this time. However, if it raises questions and points in the direction of potential areas of research it

should serve its purpose as one way to initiate discussion of some of the main problems involved in the investigation of group functioning. (Author)

PB 149 833 $2.60

Psychological Research Associates, Inc., Arlington, Va.
THE RETENTION OF A CONTINUOUS CONTROL PERCEPTUAL-MOTOR SKILL, by James F. Parker, Jr. and Edwin A. Fleishman. Rept. on Contract Nonr-3065(00). July 60, 30p. 7 refs. PRA rept. 60-37; AD-241 165.

DESCRIPTORS: *Learning, Training, Tracking, *Psychomotor tests, Motor reactions, Memory, *Military training.

The effectiveness of massed vs distributed practice was investigated in the retraining of a perceptual-motor skill. Results indicate that the retention of a complex continuous control skill is quite high even for no practice intervals of up to 24 months. For subjects trained initially to a high level of proficiency, virtually no loss was observed for periods of up to 14 months. For subjects showing some performance degradation, the major part of the performance capability was regained within the first several minutes of the retraining period. Retraining administered under conditions of distributed practice will show a superiority over that administered under massed practice if performance during training is recorded. However, at some later period no difference will be noted between the two retraining procedures. The massed group will have improved to a point comparable to that of the distributed practice group. A set of basic perceptual-motor ability factors was not found to be effective in predicting the retention of this continuous control skill. (Author)

PB 149 907 $10.50

Small Groups Research Center, Washington U., St. Louis, Mo.
STUDIES IN THE PSYCHOLOGY OF AGRESSION, by Richard deCharms and Edward J. Wilkins. Technical rept. no. 5 on Contract Nonr-816(11). July 60, 133p. 40 refs. AD-241 140.

DESCRIPTORS: Psychology, Emotions, *Behavior, *Adjustment (Psychology), Needs, Reaction (Psychology), Theory, Stress (Psychology).

An attempt was made to analyse and clarify the conditions for and the mechanisms of change in hostility. The view is presented that the failure of drive-reduction theorists to distinguish between any hostile response and an effective one has led to the false appearance of the catharsis phenomenon. It is one of the major contentions of this paper that the hostile (or other) responses to the threat will continue until one is successful in reducing the threat value of the stimulus. Four experiments were presented which deal with some of the problems in the area of the psychology of aggression. The major foci of these experiments were the ways in which hostility is reduced and the phenomena of vicarious reduction of hostility. (Author)

PB 153 925 $1.10

Stanford U. [Calif.]
CEREBRAL MECHANISMS AND DECISION PROCESSES, by Karl H. Pribram. Final rept. Jan 57-Dec 59, on Contract [DA 49-007-md] 763, continuation of Contract [DA 49-007-md] 401. [1959] 10p. 13 refs; AD-230 378.

DESCRIPTORS: *Brain, *Reasoning, *Behavior, Reaction (Psychology), Physiology, Surgery.

Studies revealed that preferences and discriminations are intimately linked with regard to the behavior of the total organism and to the neural substrate which serves that behavior. The attempt to separate preference from discrimination proved extremely difficult. A review and a substantive statement of some hypotheses concerning the function of those neural structures not involved in preference and discrimination are given. These structures subsume a class of behavior for which delayed alternation and delayed reaction tasks are the paradigm.

BIOLOGICAL SCIENCES

PB 154 068 $1.10

Naval Civil Engineering Lab., Port Hueneme, Calif.
A CREOSOTE TOLERANT MARINE BACTERIUM, by Thomas B. O'Neill, Richard W. Drisko, and Harry Hochman. 16 Nov 60, 8p. 8 refs. TN-398; AD-249 656.

DESCRIPTORS: *Creosote, Bacteria, Marine biology, *Pseudomonas, Marine borers, Control.

In a study of the marine biological environment in which creosoted piling are located, a previously unreported species of bacteria was isolated. This species was detected on creosoted piling from eleven widely differing locations and was the predominant species of bacteria found on these piling. The new organism was identified as a gram negative rod belonging to the genus Pseudomonas and has been named Pseudomonas creosotensis. It has been completely described by the standard morphological and biochemical tests. (Author)

Anatomy and Physiology

PB 155 542 $1.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
THE PHYSICS OF THE MERCURY STRAIN GAUGE AND OF ITS USE IN DIGITAL PLETHYSMOGRAPHY by C. J. Eagan. Feb 61, 14p. 7 refs. Technical note AAL-TN-60-17; AD-253 713.

DESCRIPTORS: *Fingers, Physiology, Mercury, *Strain gages, Volume, Instrumentation, *Blood circulation, Measurement, Skin.

PB 154 225 $2.60

Arctic Aeromedical Lab. [Fort Wainwright] Alaska. A STUDY OF THE MAINTENANCE OF THERMAL BALANCE IN THE ESKIMO, by Frederick A. Milan. Nov 60, 23p. 21 refs. Technical rept. 60-40; AD-249 798.

DESCRIPTORS: *Eskimos, Arctic regions, Climatic factors, Physiology, Stress (Physiology), Temperature, *Body temperature, Metabolism, Exposure, Clothing, Sociology, Insulating materials.

An investigation of the maintenance of thermal balance in five clothed Eskimos living in the village of Wainwright, Alaska, was undertaken in March and April, 1960. Skin and rectal temperatures were measured as the subjects carried on with some of their daily food quest activities in the cold. There were no significant differences between control values and measurements made in experiments lasting up to 8 hours in any temperature parameter. Ambient temperatures ranged between -26 and-14 C and wind speeds between 0 and 24 knots. At these temperatures thermal balance was maintained by the insulation of the clothing rather than high levels of activity. Energy expenditures for a number of activities in this environment were calculated from the measured respiratory exchange of these subjects. The elevated thermoneutral metabolisms seen in these Eskimos is conjectured as being advantageous to them in the cold only when in thermal balance. Because of the heavy insulation of the clothing, the excess heat lost from the face would serve to warm that area. (Author)

PB 155 541 $1.10

Arctic Aeromedical Lab., Fort Wainwright, Alaska. TECHNIQUES IN MERCURY GAUGE PLETHYSMOGRAPHY SPECIFIC TO THE RABBIT EAR, by C. J. Eagan. Rept. on Public Health Service Grants HTS 5147 and H 2962, and Contract AF 41(657)216. Mar 61, 10p. Technical note AAL TN 60-16; AD-253 712.

DESCRIPTORS: *Ear, Rabbits, Mercury, Gages, Measurement, Volume, Physiology, Instrumentation, Military personnel, *Blood circulation, Tables, Calibration.

Modifications to the mercury gauge method of digital plethysmography make possible its application to the rabbit ear. The ear is attached over a plastic centrifuge tube and a calibrated ear gauge is fitted over the ear and tube. The circumference of the tube alone will be 2 to 3 mm less than when the ear is attached. From this, the cross-sectional area of the tissue under the gauge can be calculated. Transient small changes in circumference (of as little as 1 micron) can be measured, and these can give quantitative values for volume pulse, and for rate of blood flow if venous occlusion is used. (Author)

PB 155 720 $1.10

Harvard Medical School, Boston, Mass. SUBSTRATE SPECIFICITY OF BRAIN AMINE OXIDASE OF SEVERAL MAMMALS, by Norman Weiner. Feb 60, 9p. 7 refs. AFSAM rept. 60-32; AD-233 170.

DESCRIPTORS: *Brain, Amines, *Oxidases, Mammals.

The substrate specificity of brain monoamine oxidase of rat, mouse, dog, cat, rabbit, guinea pig, and human has been determined. The substrate specificity patterns are similar for rat, mouse, dog, cat, and human, though generally less active in the latter two species. Tyramine and dopamine are most readily oxidized. Isoamylamine is a slightly poorer substrate, and epinephrine, norepinephrine, tryptamine, and 5-hydroxytryptamine are only moderately readily oxidized. n-Amylamine, phenylethylamine, and β-phenylethanolamine are poor substrates for these five species. Rabbit brain amine oxidase differs from the amine oxidase of these species in being considerably better able to oxidize n-amylamine, phenylethylamine, and tryptamine. Guinea pig brain amine oxidase appears to be intermediate between those of rabbit and the other species. The significance of these findings is discussed. (Author)

PB 154 954 $3.60

Oslo U. (Norway). INTERHIPPOCAMPAL IMPULSES. III. BASAL DENDRITIC ACTIVATION OF CA3 NEURONS, by Per Andersen. Rept. on Contract AF 61(514)1127. [1959] 35p. 37 refs. AFOSR-TN-59-999; AD-226 756.

DESCRIPTORS: *Cerebral cortex, Stimulation, Physiology, Temperature, Anoxia, Electrical properties, Drugs, *Nerves, Electrodes.

The commissural afferents to the hippocampal field CA3 terminate in the layer of the basal dendrites only, making selective basal dendritic activation possible. The response of CA3 in response to a symmetrical contralateral stimulation is a diphasic spike followed by a negative wave, sometimes with a superimposed spike. The diphasic spike represents interhippocampal fibre activity. The negative wave was recorded only from the CA3 basal dendritic layer. It is partly an excitatory postsynaptic potential produced in the basal dendrites by the commissural volley, partly a postsynaptic CA3 neuron discharge. The spike is a more synchronous discharge of the same neurons. The commissural volley elicits spikes more seldom in CA3 than in CA1, where apical dendritic activation is the most prominent, suggesting that a cell discharge is easier produced by apical than by basal dendritic activation. The susceptibility to anoxia is similar for the two fields. Strychnine normally produces great changes in CA1 potentials, but has only minor influence on the CA3 commissural response. (Author)

PB 154 953 $4.60

Pisa U. (Italy).
EVIDENCE FOR THE EXISTENCE OF AN EEG SYNCHRONIZATION MECHANISM ORIGINATING IN THE LOWER BRAIN STEM, by J. Pierre Cordeau and Mauro Mancia. Rept. on Contract AF 61(514)1125. 1959, 42p. 24 refs. [AFOSR-TN-59-973] AD-226 322.

DESCRIPTORS: *Brain, Stimulation, *Sleep, Inhibition, Physiology, *Electroencephalography.

A test was made of the hypothesis that the prolonged periods of low voltage fast activity and the high degree of EEG activation shown by the midpontine pretrigeminal cat results from the withdrawal of some synchronizing or sleep-inducing influence from the caudal parts of the brain stem. To this purpose, the electrocortical activity of cats with chronic midpontine pretrigeminal hemisections was recorded. Results favor the existence of a synchronizing mechanism which originates in the caudal part of the brain stem. This mechanism influences the hemisphere contralateral to the pontine hemisection, where sleep patterns were seen through the intact half of the brain stem, while it is prevented from doing so on the side of the lesion, where the electrocortical activity remained predominently desynchronized. The possible characteristics and properties of this synchronizing mechanism are discussed in the light of present day knowledge concerning the control of the electrocortical activity in the cat.

PB 155 071 $4.60

Rome Air Development Center, Griffiss AFB, N. Y.
INVESTIGATORS' CONFERENCE ON BIOLOGICAL EFFECTS OF ELECTRONIC RADIATING EQUIPMENTS, 14-15 JANUARY 1959. July 59, 48p. 4 refs. RADC-TR-59-67: AD-214 693.

DESCRIPTORS: *Microwaves, Physiology, Genetics, Pathology, Conferences, *Electronic equipment, Resonance absorption, Embryos, Chickens.

Contents:
Report from the State University of Iowa, Dept. of Physiology, C. J. Imig and G. W. Searle
Neural effects of microwave radiation, by R.T. Nieset, R. D. McAfee, R. Baus, J. D. Fleming and L. R. Pinneo
Report of work in progress at Tufts University, by R. L. Carpenter, D. K. Biddle and C. A. Van Ummersen
Effects of microwave on the chick embryo, by C. A. Van Ummersen
Summary of research performed at the University of California, by Dr. Charles Susskind
Studies on the biological effects of 200 megacycles, by F. Fischer, R. Neubauer, Y. Sarkees, C. M. Osborn and Dr. C. Addington
Microwave absorption measurements, by O. M. Salati
Review of work accomplished at the New England Institute for Medical Research, by A. A. Teixeira-Pinto, J. L. Cutler and J. H. Heller
Preliminary investigation of the applications of magnetic resonance absorption spectroscopy to the study of the effects of microwaves on biological materials, by G. Pish, H. W. Storey and F. K. Truby
Review of work conducted at St. Louis University School of Medicine, by A. W. Richardson
Equipment and methods employed in the exposure of experimental animals to microwaves at 24,000 megacycles, by F. H. Stephens

PB 155 461 $10.10

Washington U., Seattle.
CHANGES IN PERIPHERAL CIRCULATION WITH EXERCISE TRAINING, by Robert Wellington Elsner. Nov 60, 122p. 219 refs. AAL Technical rept. 59-16; AD-253 459.

DESCRIPTORS: *Blood circulation, *Exercise, Training, Physiology, Body temperature, Measurement, Eskimos, *Military personnel, Alaska, Arctic regions, Medical research.

An investigation has been made of physiological responses to moderate exercise in young adult men. Studies were made of four groups of subjects. A group of university athletes was compared with non-athletic students. Sedentary subjects were studied before and after a period of exercise training. Young Eskimo men from a remote Alaskan village were also investigated and compared with the Caucasian groups. Before and after exercising, the subjects rested in the recumbent position. Oxygen consumption, heart rate, and rectal and skin temperatures were measured from minute to minute before, during, and after exercise. The blood flow in the calf was measured with a mercury-in-rubber strain gauge plethysmograph before and after exercise. Oxygen consumption during exercise and during recovery was similar in all groups when the values were referred to surface area of the subjects. Other experiments were performed to test the importance of changes in body temperatures produced by exercise on the postexercise blood blow response.

PB 155 462 $6.60

Washington U., Seattle.
COLD INJURY AND FROSTBITE. A SELECTED, ANNOTATED BIBLIOGRAPHY, by L. D. Carlson and H. L. Thursh. Dec 60, 64p. 56 refs. AAL Technical rept. 59-20; AD-253 479.

DESCRIPTORS: Bibliography, *Exposure, *Frostbite, Injuries, Therapy, Physiology, Freezing, Drugs, Barbiturates, *Tissues (Biology).

Cold injury and frostbite appear to cause irreparable damage to tissue. The principle in treatment is to prevent further damage as a result of the local trauma and allow the normal reparative processes optimal conditions. There is considerable doubt as to the best method of treatment and even more doubt as to the most effective prophylactic procedures (using drugs, et cetera, rather than sound, properly conceived protective devices). (Author)

PB 154 226 $3.60

Washington U., Seattle
THE CONTROL OF BODY TEMPERATURE, by Thomas Adams, July 60, 35p. 77 refs. AAL Technical rept. 59-21; AD-249 794.

DESCRIPTORS: *Body temperature, Physiology, Control, Stress (Physiology), Exposure, Shivering, Nervous system, Metabolism, Heat production (Biology), Bibliography.

It is difficult, perhaps, to appreciate at first the degree of freedom from one's thermal environment that is afforded the homeotherm; yet as an evolutionary stepping stone, the ability to maintain a controlled, although not altogether constant, internal temperature has provided a considerable and an important edge in competition with poikilothermic contemporaries. An attempt has been made to provide a sketch of the physiological, neurophysiological, and endocrinological principles involved in this function, and to introduce the reader to the more important, and in some instances, classical literature in these areas of interest. (Author)

PB 154 223 $1.60

Washington U., Seattle.
NONSHIVERING THERMOGENESIS AND ITS ENDOCRINE CONTROL, by L. D. Carlson. Rept. on Contract AF 41(657)216. Sep 60, 19p. 19 refs. AAL Technical rept. 60-1; AD-249 795.

DESCRIPTORS: *Heat production (Biology), *Exposure, Shivering, Inhibition, *Autonomic nervous system, Drugs, *Thyroid gland, Excision, *Thyroxine, Epinephrine, Hypothalamus, Muscles, Electrical properties, *Hormones, Oxygen consumption, *Endocrine glands.

Nonshivering thermogenesis designates an increase in heat production by an animal exposed to cold without detectable muscle activity as determined by the electromyogram. Nonshivering thermogenesis may exist in varying degrees in the rat, rabbit, dog, and man, but only in the rat has the effect of cold acclimation in enhancing this avenue of heat production been clearly shown. The enhanced heat production on cold exposure in a curarized animal is brought about by the autonomic nervous system, and is suppressed by autonomic blocking agents and by sympatholytic drugs. Thyroidectomy reduces the response and confirms the role of thyroxin in the cold-acclimated animal. In addition, the calorigenic activity of epinephrine is potentiated by acclimation and noradrenaline becomes markedly caloregenic. (Author)

Biochemistry

PB 155 094 $2.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
THE EFFECTS OF DIET ON SELECTED GLYCOLTYIC ENZYMES OF THE RAT, by David A. Vaughan, John P. Hannon and Lucile N. Vaughan. Jan 61, 22p. 24 refs. Technical rept. 60-17; AD-254 300.

DESCRIPTORS: *Diet, *Enzymes, Chemical reactions, *Rats, Physiology, *Glycolysis, Muscles, Liver, Carbohydrates, Tests.

The activities of selected glycolytic enzymes from the liver and muscle of rats subsisting for 4 and 40 days on carbohydrate-free diets high in fat or protein were compared with enzymes from rats fed high-carbohydrate diets. The following changes were noted in liver: high-fat -- a decrease in phosphorylase, glucokinase, glucose-6-phosphate dehydrogenase and formation of pyruvate from 3-phosphoglycerate with no change in glucose-6-phosphatase and phosphoglucomutase; high-protein -- an increase in phosphorylase and a decrease in glucose-6-phosphatase and glucokinase -- the other enzymes were unaffected. These diets had no effect on the activity of the enzymes in muscle, except that the high-fat diet depressed muscle glucokinase. The activities of muscle phosphorylase and the formation of pyruvate increased from 4 to 40 days while the activity of muscle glucose-6-phosphate dehydrogenase decreased. It was concluded that the response of liver glycolytic and oxidative enzymes to carbohydrate removal depended to a large extent upon the nutrient substituted. In muscle, glycolysis proceeds apace without regard to dietary manipulations. (Author)

PB 155 070 $1.60

[Oxford U. (Gt. Brit.)]
THE METABOLISM OF ACETATE IN MICRO-ORGANISMS. Technical (Final) rept. 1 Feb 57-31 Jan 59, on Contract AF 61(514)1180. 1959, 18p. 14 refs. AFOSR-TR-59-48; AD-215 261.

DESCRIPTORS: *Acetates, *Metabolism, *Micro-organisms, Growth, Biochemistry, Carbon compounds.

Contents:
The metabolism of acetate in micro-organisms
The conversion of fat to carbohydrates by fatty seedlings
The metabolism of other C_2-compounds in micro-organisms
The metabolism of C_1-compounds in micro-organisms
Metabolism of formate in Pseudomonas oxalaticus
Metabolism of C_1-compounds in Hyphomicrobium vulgare
Metabolism of C_1-compounds in an unidentified bacterium

Pathology

PB 152 600 $2.60

Army Chemical Research and Development Labs., Army Chemical Center, Md.
AN ANTIGEN-LIKE SUBSTANCE ISOLATED FROM HOMOLOGOUS IMMUNE SERUM, by John J. Cuculis, Theodore D. Gardiner, and Ludwig Sternberger. Aug 60, 23p. 20 refs. CRDLR 3025; AD-243 411.

DESCRIPTORS: *Serum, *Immunization, *Antigens, Antibodies, Blood circulation, Precipitation, Separation.

When in active immunization antigen disappears from circulation and antibody becomes apparent, peculiar

precipitates can be isolated from serum by brief alkali treatment in the cold. One of the constituents of these precipitates has previously been described as a nonprecipitating type of antibody. The present paper reports a second constituent detectable after elimination of the injected antigen during the time when antibody is found in circulation. The procedure involves injection of I^{131} bovine plasma globulin into donor rabbits. Alkali precipitates are isolated from the sera obtained from these rabbits after complete disappearance of the antigen label and at a time when excess antibody is found in circulation. The material is then injected into recipient rabbits. It is shown that these recipient rabbits form antibodies actively against bovine plasma globulin although they have never been exposed directly to such antigen. The alkali precipitates from immune sera may contain an antigen-like substance distinct from the original immunizing antigen; possibly, it acts as one of the intermediates in antibody formation. (Author)

PB 154 505 $2.60

[Graz U. (Austria)]
A STUDY OF CEREBROVASCULAR CHANGES AND CEREBRAL EDEMA, by F. L. Jenkner. Annual technical rept. no. 1, 1 Feb 60-31 Jan 61 on Contract DA 91-591-EUC-1380. [1961] 30p. 7 refs. AD-251 176.

DESCRIPTORS: *Brain, *Edema, Drugs, *Vasomotor drugs, Blood vessels, Blood circulation, Electroencephalography, Blood pressure, Production.

The injection of acetylcholine, caffeine, and papaverine, the inhalation of amyl nitrite and ether and the intragastric instillation of alcohol effect the cerebral vessels in the sense of a dilation. The most effective vaso-dilating drug is amyl nitrite. Epinephrine, caffeine and ergotamine change the state of cerebral vessels in a constrictive fashion. The reaction of an injection of aminophylline i. p. caused vaso constriction. The inhalation of CO2, O2 and some other substances had no unequivocal effect on the rheoencephalograph.

The performance of an experimental preliminary craniectomy was of no effect on the control REG. The introduction of Psyllium seeds changed the REG tracing in a particular way. The intracerebral injection of between 0, 1 and 0.5 ml of distilled water into one hemisphere changed the control record as well as the effect certain tests has on the REG. (Author)

Radiobiology

PB 154 307 $2.60

Fission Products Lab., U. of Michigan, Ann Arbor.
HIGH RADIOPASTEURIZATION OF FOODS, by Lloyd E. Brownell. Rept. no. 7 (Final) 21 Sep 57-2 Dec 58, on Contract DA 19-129-qm-1069. [1959] 30p. 19 refs. 2718-7-F; File no. S-550; AD-235 242.

DESCRIPTORS: *Food, *Radiation effects, Acceptability, Biochemistry, *Tomatoes, Dose rate, *Meat, Heating, Packaging, *Pasteurization.

The protective action of tomato products on irradiated food was confirmed in experiments in which the addition of tomato serum to a Beef Stew recipe, which had previously produced an unsatisfactory irradiated product, reduced the production of radiation off-flavor in the beef to a point where the product was considered acceptable. It was decided, therefore, to investigate tomato and tomato products to determine the nature of the mechanism of radiation off-flavor protection, and to attempt to formulate a mixture of tomato biochemical constituents which inhibit the formation of off-flavors and off-odors without imparting tomato flavors to the treated food. It was determined in the organoleptic screening of ground cooked beef treated with tomato constituents that the carbohydrates, particularly the monosaccharides, a glutamate, Vitamin E (alpha-tocopherol), Vitamin C, Vitamin A, and other carotenoids were effective in preventing the formation of off-flavors. Heating produced a superior product with very little off-flavor and off-odor. Temperatures between 160°F-180°F were the most effective in minimizing off-flavors. A thermostatically controlled water bath yielded the best results. Open and closed polymylar packaged materials were tested. The open arrangement yielded a slightly better product. Finally, a cooked beef product, meatballs and gravy, was developed which possessed no detectable radiation off-odors or off-flavor at 4.8 megarep. It is believed that simultaneous heating during irradiation with the additive mixture of certain tomato biochemicals offers a successful and promising technique for the prevention of radiation off-odors and off-flavors. (Author)

UCRL-9419 $1.75

Lawrence Radiation Lab., U. of California, Berkeley.
A STUDY OF THE METABOLIC FATE OF THE RADIATION-PROTECTIVE COMPOUND S, 2-AMINOETHYLISOTHIURONIUM BROMIDE (AET), IN THE RAT, by F. P. Conte. Rept. on Contract W-7405-eng-48. 10 Oct 60, 77p.

COO-223 $0.50

Utah U. Coll. of Medicine, Salt Lake City.
RESEARCH IN RADIOBIOLOGY. Annual rept. of work in progress on the chronic toxicity program on Contract AT(11-1)-119. 31 Mar 61, 31p.

CHEMISTRY

IS-192 $2.50

Ames Lab., Iowa State U. of Science and Tech.
ANNUAL SUMMARY RESEARCH REPORT IN CHEMISTRY. Rept. 1 July 59-30 June 1960, on Contract W-7405-eng-82. Sep 60, 119p.

SCR-245 $4.00

Sandia Corp., Albuquerque, N. Mex.
TABLE OF ATOMIC MASSES, ed. by J. W. Guthrie. Monograph. Feb 61, 301p.

Analytical Chemistry

PB 155 165 $5.60

Florida State U., Tallahassee.
BASIC RESEARCH IN THE GENERAL FIELD OF SPECTROSCOPIC ANALYSIS, by Russell J. Kiers. Final rept. 1 July 53-31 Aug 57 on Contracts DA 01-009-[ORD]-(327, 457). [1957] 56p. 23 refs. OOR Proj. 841; AD-144 911.

DESCRIPTORS: *Organic compounds, *Photometers, Absorption, Determination, Calibration *Photomultipliers, *Phosphorescence, *Spectrographic analysis, *Chemical analysis.

These experiments indicate that certain organic compounds can be determined by analysis of the phosphorescent emissions excited in the compounds under appropriate conditions. Where the method has been challenged by choosing compounds of very similar absorption or phosphorescent characteristics, initial results have been gratifying. The average relative error found upon determining the concentrations of known solutions by this method was about 10%, excluding an unfavorable result involving benzophenone in a mixture with acetophenone, where the concentration was at the exceedingly low value of 3.5×10^{-6}M. The data substantiate the statement that the precision determined by running replica samples is much higher than the accuracy obtained in these initial runs, indicating that the accuracy can be improved by controlling experimental parameters more carefully. To this end a calibration of the photomultiplier photometer is indicated, as well as selection of a suitable phosphorescent substance that will serve as a standard to duplicate excitation and photometry conditions from day to day. (Author)

GAT-372 $0.50

Goodyear Atomic Corp., Portsmouth, Ohio.
DETERMINATION OF SELENIUM IN URINE, VEGETATION, AND SOIL, by E. M. Ray. Rept. on Contract AT-(33-2)-1. 8 Mar 61, 10p.

IDO-14549 $0.50

Phillips Petroleum Co., Idaho Falls.
COMPARATIVE BORON ISOTOPIC ANALYSIS, by P. Goris, T. D. Morgan, and R. A. Nielsen. Rept. on Contract AT(10-1)-205. 3 Apr 61, 9p.

Organic Chemistry

PB 150 270 $3.60

British Columbia U. (Canada).
AMINE DERIVATIVES OF VANADIUM AND NIOBIUM PENTAFLUORIDES (I) [AND] SOME SALTS OF TRIFLUOROMETHYLFLUOBORIC ACID (II), by R. G. Cavell, R. D. Chambers and others. Technical rept. no. 2 on Volatile Fluoro Compounds, Contract Nonr-2659(00). July 60, 33p. 30 refs. AD-242 224.

DESCRIPTORS: *Vanadium compounds, *Niobium compounds, Amines, Fluorides, Ammonia, Pyridines, Chemical reactions, Molecular structure, Borates, *Fluoborates, *Tin compounds, Methyl radicals, Metalorganic compounds, Ammino compounds.

I. The reactions of vanadium pentafluoride with ammonia, pyridine, and ethylendediamine produce amminotetrafluorovanadium (IV), pyridine tetrafluorovanadium (IV), and tris(ethylenediamine) tetrafluorovanadium (IV), respectively. Niobium pentafluoride reacts with ammonia and ethylenediamine to give diamminopentafluoroniobium (V) and a product of composition $NbF_5(en)_{1.6}$. The infrared spectra of these new compounds are discussed and the reasons for the production of these compounds is considered in terms of maximum coordination state and fluorine-bridge bonding. II. Trimethyltrifluoromethyltin reacts with boron trifluoride to give a 1:1 adduct, formulated as trimethyltin trifluoromethylfluoborate $(CH_3)_3Sn^+$, $[CF_3BF_3]^-$. The potassium, barium, and ammonium salts of the hypothetical trifluoromethylfluoboric acid, HBF_3CF_3, are prepared from this adduct. The stability of the ion $[CF_3BF_3]^-$ is attributed to the saturation of the acceptor tendencies of the boron atom and the delocalisation of the charge on the ion. (Author)

PB 153 815 $3.60

Pennsalt Chemicals Corp., Wyndmoor, Pa.
SULFUR-NITROGEN SYSTEMS. PART II: A NEW CLASS OF AROMATIC REARRANGEMENTS. THE MIGRATION OF ARYL SUBSTITUTED SULFAMYL GROUPS, by F. L. Scott and C. W. Schaumann. Technical rept. no. 13 on Contract Nonr-2687(00). 15 Mar 60, 34p. 24 refs. AD-234 858.

DESCRIPTORS: *Sulfur compounds, *Amides, *Anilines, Monocyclic compounds, Chemical reactions, *Sulfamyl radicals, Phenyl radicals, *Nitrogen compounds.

We have established that when aniline and sulfamide are reacted, in a 1:1 ratio, at 150° in the presence of an acid catalyst, they form sulfanilanilide (II) and not 1, 3-diphenylsulfamide (I). When sulfamide is refluxed in a large excess of aniline it does yield (I). The substance (I) thus obtained can be converted into (II) under appropriate conditions and this conversion exemplifies a new aromatic rearrangement. When (I) is allowed to rearrange in dimethylaniline as solvent, 4-dimethylaminobenzenesulfonanilide (III) is formed, and this points to the intermolecular character of the rearrangement. With nuclear alkyl substitution in (I), as e. g. in 1, 3-di-p-tolysulfamide (IV), the reaction still proceeds readily, (IV) reacting with dimethylaniline to yield the 4-dimethylaminobenzenesulfon-p-toluide (V). However, with alkyl substituents on the nitrogen, e. g. with 1, 3-diphenyl-1, 3-dimethylsulfamide (VII), no rearrangement could be detected. When 1-phenylsulfamide was employed, rearrangement was observed even though in low yield. The rearranging species could not be induced to attack a phenol ether, rearrangement when it occurred attacking a nitrogen base rather than the phenolic activated aromatic ring. A probable mechanism for these reactions is suggested. (Author)

PB 153 816 $1.60

Pennsalt Chemicals Corp., Wyndmoor, Pa.
SULFUR-NITROGEN SYSTEMS. PART III: THE SYNTHESIS AND REARRANGEMENT OF 1, 3-Di-(2'-PYRIDYL)SULFAMIDE, by F. L. Scott and J. P. King. Technical rept. no. 14 on Contract Nonr-2687(00). Mar 60, 12p. 12 refs; AD-234 859.

DESCRIPTORS: *Sulfur compounds, *Amides, Synthesis, *Pyridines, Chemical reactions, *Nitrogen compounds

We have synthesized 1, 3-di(2-pyridyl)sulfamide (II) and have established that it can undergo rearrangement in dimethylaniline solution to yield 4-dimethylaminobenzene-sulfon-(2-pyridyl)amide(VI). The synthesis, incidentally, of II from 2-aminopyridine and sulfamide in pyridine solution is complex and results in a total of 4 products. Reaction of II in boiling excess aniline yielded 1, 3-diphenylsulfamide (I) and a small quantity of the latter's rearrangement product, sulfanilanilide (IX). Thus we have determined that amide exchange reactions with II are more facile than its rearrangement. Addition of an acid catalyst, viz., aniline hydrochloride greatly increases the extent of rearrangement of I, as was expected, and it did not result in the observation of any rearrangement of II. When II was allowed to react with aniline in phentole solution in the presence of a catalyst again its exchange reaction to yield I was exceedingly rapid, this in turn rearranged rapidly to IX, which was the major product obtained. No evidence for attack of solvent was obtained. (Author) (See also PB 153 815)

PB 149 308 $1.60

Rensselaer Polytechnic Inst., Troy, N. Y.
DERIVATIVES OF AROMATIC SULFINIC ACIDS. IV. THE ABSOLUTE CONFIGURATION OF ASYMMETRIC SULFUR IN EPIMERIC SULFINIC ESTERS, by Harry F. Herbrandson and Carmen M. Cusano. Technical rept. no. 2 on Contract Nonr-1787(00). 19 July 60, 17p. 25 refs. AD-239 968.

DESCRIPTORS: *Sulfinic acids, Monocyclic compounds, Benzenes, Molecular structure, *Isomers, Chemical equilibrium, Chemical bonds, Stability, Iodides, Ethanols, Esters, Sulfur compounds, Suflinyl radicals.

Equilibration of 1-menthyl d-p-iodobenzenesulfinate and 1-menthyl l-p-iodobenzenesulfinate in nitrobenzene at 25° gives a mixture which contains 59 + 3% of the d-epimer. To ethoxide ion catalyzed ethanolysis, the d-epimer is more reactive by a factor of about two. These facts have been interpreted in terms of a tentative assignment of absolute configurations to the asymmetric sulfurs and conformations of the two esters. (Author)

Physical Chemistry

ANL-5889 Addendum $0.50

Argonne National Lab., Ill.
DEUTERIUM-HYDROGEN EXCHANGE IN BOEHMITE CORROSION PRODUCT FORMED ON PURE ALUMINUM IN BOILING WATER, by S. Mori, J. E. Draley, and R. B. Bernstein. Rept. on Contract W-31-109-eng-38. Apr 61, 5p.

PB 148 880 $1.10

Chicago U., Ill.
TRACER EXPERIMENTS ON THE REACTION OF HU_3 IN WATER, by Umesh Agarwala, J. B. Hunt, and H. Taube. Rept. on Contract Nonr-2121(16). [1960] 4p. 4 refs. AD-239 162.

DESCRIPTORS: *Uranium, *Hydrides, *Heavy water, *Tracer studies, Mass spectroscopy, Oxidation, Chemical reactions.

PB 154 105 $1.10

Florida State U., Tallahassee.
AN APPROXIMATE METHOD FOR MEASURING THE SELF-INTERACTION OF NON-ELECTROLYTES IN TWO-COMPONENT SOLVENTS, by Ernest Grunwald and George Baughman. Rept. on Contract [Nonr] 988(02). [1960] 8p. 7 refs.

DESCRIPTORS: *Solutions, Chemical equilibrium, Organic solvents, Thermodynamics, *Activity coefficient, Measurement, Naphthalenes, Naphthoic acids, Solubility, Solvent action, Chemical reactions.

A method is described for measuring the self-interaction constant, k_i, in the expression for the molal activity coefficient of a non-electrolyte solute, $\ln \gamma_i = k_i m_i$. The method applies particularly to non-volatile solutes in two-component solvents, and makes use of solubility data for the solute at several solvent compositions and vapor pressure data for the solvent components. The method can yield results of respectable accuracy in many cases where no other practical method exists. (Author)

PB 154 096 $2.60

Florida State U., Tallahassee.
SALT-INDUCED MEDIUM EFFECTS: I. SALT-EFFECTS ON THE ACTIVITY COEFFICIENTS OF NAPTHALENE AND 1-NAPTHOIC ACID IN 50 wt. % DIOXANE-WATER, Ia, b, by Ernest Grunwald and Arthur F. Butler. Technical rept. on Contract Nonr-988(02). 15 Apr 60, 25p. 29 refs.

DESCRIPTORS: *Naphthalenes, *Naphthoic acids, Solubility, Chemical equilibrium, *Salts, Electrolytes, *Solvent action, Ionization, Ethylenes, Dioxides, Heterocyclic compounds, Water, Organic solvents, *Solutions, *Activity coefficient, Measurement, Thermodynamics.

This paper reports salt effects on the activity coefficients of naphthalene and 1-naphthoic acid in 50 wt. % dioxane-water. This study was undertaken because information concerning the activity coefficients of nonelectrolytes in the presence of salts is surprisingly incomplete for water-organic solvent mixtures, and because any information gained might find immediate application in chemical kinetics and in the elucidation of reaction mechanism.

PB 154 106 $2.60

Florida State U., Tallahassee.
SALT-INDUCED MEDIUM EFFECTS: II. KINETIC SALT-EFFECTS IN THE SOLVOLYSIS OF NEOPHYL p-TOLUENESULFONATE AND IN THE RACEMIZATION OF L-(+)-THREO-3-PHENYL-2-BUTYL p-TOLUENESULFONATE IN 50 wt.% DIOXANE-WATER. Ia, by E. F. J. Dyunstee, Ernest Grunwald and Martin L. Kaplan. Rept. on Contract [Nonr] 988(02). [1960] 24p. 19 refs.

DESCRIPTORS: *Sulfonates, Toluenes, Solubility, Chemical equilibrium, *Salts, Electrolytes, *Solvent action, Ionization, Ethylenes, Dioxides, Heterocyclic compounds, Water, *Racemization, Organic solvents, *Solutions, *Activity coefficient, Measurement, Thermodynamics.

In order to resolve the problem whether kinetic salt-effects in the ionization step of SNI reactions are colligative, rate constants, k_1, were measured for the solvolysis of neophyl p-toluenesulfonate and for the racemization of L-(+)-threo-3-phenyl-2-butyl p-toluenesulfonate in 50 wt.% dioxane-water in the presence of the following salts: NaOH, NaCl, LiCl, NaBr, $NaNO_3$, NaI, $NaClO_4$, $2\text{-}C_{10}H_7SO_3Na$, $(CH_3)_4NCl$, $(C_6H_5)_4PCl$. The salt-effects were highly specific; values of the parameter, S, in the empirical equation: $\log(k_1/k_1^o) = S\ m4$ (where m4 is the salt molality) ranged from ca. +0.5 for $NaClO_4$ to ca. -0.6 for NaOH. Comparison of k_1 with rate constants for direct second-order reactions with anions indicated that such reactions could not account for the observed specificity of salt-effects on k_1. For the solvolysis of neophyl p-toluenesulfonate, such parallel reactions should be insignificant; for threo-3-phenyl-2-butyl p-toluenesulfonate, newly measured rate constants for the substitution reaction of this compound and of ethyl p-toluenesulfonate with lithium bromide in anhydrous acetone indicated that direct reaction with the anion might possibly make a small contribution to the observed salt-effect on the racemization rate when the salt is NaOH, NaBr and NaI. (Author) (See also PB 154 096)

PB 154 252 $4.60

General Electric Co., Schenectady, N. Y.
RECOMBINATION KINETICS FOR THERMALLY DISSOCIATED Li-B ION PAIRS IN Si, by E. M. Pell and F. S. Ham. Scientific rept. no. 5 on Contract AF 19(604)5551. 14 Dec 60, 44p. 20 refs. AFCRL-5; AD-249 825.

DESCRIPTORS: *Lithium, *Boron, *Ions, Ionization, Temperature, *Silicon, Diffusion, *Impurities, *Pair production, Recombination reactions, Semiconductors, *Dissociation.

The kinetics of a diffusion limited pairing reaction between oppositely charged impurity ions in a solid have been studied by observing the capture of mobile Li(+) ions by B(-) ions in Si. The kinetics were determined by measuring resistivity vs. time after the method of Reiss, Fuller, and Morin (Bell System Tech. J. 35:535 1956); as pairing proceeds, the resistivity decreases because of the disappearance of the charged impurity scattering associated with unpaired ions. Measurements were made between 2 C and 35 C. The observed kinetics are not of first order and are best described by a model in which pairing is largely a random process with little correlation between particular Li(+) and B(-) ions. Diffusion constants of Li(+) calculated from the kinetics are in accord with previous ion drift results. (Author)

HW-67793 $0.50

Hanford Atomic Products Operation, Richland, Wash.
STUDIES OF SURFACE SORPTION IN GAS-GRAPHITE SYSTEMS. PRELIMINARY REPORT, by T. J. Clark and R. C. Giberson. Rept. on Contract AT(45-1)-1350. Feb 61, 18p.

PB 154 797 $1.60

Illinois U., Urbana.
ELECTRICAL BEHAVIOUR OF PASSIVE IRON, by Jack L. Ord and James H. Bartlett. Technical rept. no. 6 (Final) on Experimental Research in Electrodeposition, Contract DA 11-022-ORD-2525. 30 Nov 60, 16p. 16 refs. OOR Rept. no. 1879:1-C; AD-248 730.

DESCRIPTORS: *Anodes (Electrolytic cell), *Iron, Sulfuric acid, Electric potential, *Electrical properties, *Corrosion research.

A summary is given of experimental and theoretical studies of the behavior of passive iron anodes in sulphuric acid. (Author)

PB 149 803 $1.60

Kansas U., Lawrence.
STUDIES ON THE REACTIONS OF PYRRYL-METAL SALTS WITH ALLYLIC HALIDES, by Calvin A. VanderWerf and Charles F. Hobbs. Technical rept. no. 1 on Contract Nonr-2751(00). 26 July 60, 11p. 2 refs. AD-241 161.

DESCRIPTORS: *Metalorganic compounds, *Allyl radicals, *Chemical reactions, *Halides, Salts, Alkyl radicals.

A study was undertaken to elucidate the factors which control the position of alkylation of pyrryl-metal salts with allylic halides. The effect of the reaction medium was studied. The solubility of pyrrylpotassium (I) was determined to be 120, 60, 43, and 31 mg/100 ml of solution in tetrahydrofuran, dioxane, diisopropyl ether, and toluene, respectively. The reactions of I, pyrrylsodium, and pyrryllithium with allyl bromide and with benzyl chloride under heterogeneous and homogeneous conditions were studied. Under homogeneous conditions, the more polar media favored alkylation at the 1-position, and the less polar media at the 2-position. As the metal was varied, alkylation at the N increased in the order $Li^+ < Na+ < K+ < (CH_3)_3+N\text{-}C_6H_5$. The results of the benzylation study paralled those of the allylation studies. The reactions were completely homogeneous and N-alkylation was favored by polar

media and by cations of the more electropositive metals, and by the trimethylphenylammonium cation. In heterogeneous reactions with benzyl chloride, the nature of the cation was considerably more important than the degree of homogeneity of the reaction. A change from heterogeneous to homogeneous conditions favored alkylation at the 1-position. Temperature had little effect on the reaction of I with benzyl chloride although an increase in temperature generally favored the formation of 2-benzylpyrrole over that of 1-benzylpyrrole and the formation of dibenzylpyrroles.

PB 154 949 $1.60

Louisiana Polytechnic Inst., Ruston.
THE PRODUCTION AND REACTION OF ALKYLPEROXY RADICALS, by Charles E. Boozer, Clifton B. Love and others. Final technical rept. 27 Jan 56-27 Jan 59, on Contract DA 01-009-ORD-470. [1959] 16p. 15 refs. OOR Proj. 1592; AD-216 347.

DESCRIPTORS: *Free radicals, Production, Chemical reactions, Alkyl radicals, *Peroxides, Decomposition.

The problem has divided itself into two major divisions: the investigation of sources of radicals and the study of the products. Diacyl peroxides have been studied in relation to the effect of structure on their decomposition rates and their efficiency of free radical production. The effect of the structure of the alkylperoxy radical on the products formed from them has also been studied using diacyl peroxides as the source of the alkyl radicals. Aliphatic azo compounds do not appear to be a good source of free radicals. Azoisopropane did not decompose conveniently in solution when irradiated with ultraviolet light. Azoisobutane (2,2'-azo-2,2'-dimethylpropane) was a fairly good source of free radicals by photochemical decomposition, but no satisfactory synthesis has been developed for this class of compounds.

PB 150 032 $1.10

Massachusetts Inst. of Tech., Cambridge.
FURTHER ASPECTS OF THE STABILITY RELATIONSHIPS OF CONCENTRATED SOLUTIONS OF HYDROGEN PEROXIDE, by W. C. Schumb. Rept. no. 55 on Contract Nonr-1841(11). 15 July 60, 10p. 2 refs. DSR no. 7476; AD-241 230.

DESCRIPTORS: *Hydrogen compounds, *Peroxides, Solutions, Stability, Decomposition, Stabilization, Storage.

A summary is given of advances in the study of the stability relationships of H_2O_2 since October 1957. The rates of decomposition of H_2O_2 solutions were redetermined, with special emphasis on the concentration range below 30 wt-% H_2O_2. These data indicate conclusively that a definite increase in decomposition rate occurs at low concentrations. The decomposition rate of H_2O_2 solutions diluted with specially prepared H_2O, which was distilled directly into the flask containing the H_2O_2, remained reasonably constant down to about 10 to 12 wt-% H_2O_2. Below this concentration a marked increase was observed; at about 3 wt-% H_2O_2 the rate tripled. Determinations were made of the decomposition rate at 50°C of a commercially available 90%-stabilized solution of H_2O_2. The relative effectiveness of inorganic stabilizers such as sodium stannate trihydrate and sodium pyrophosphate decahydrate was determined. Both stabilizers were adequate to hold the decomposition rate at a satisfactorily low value over the entire concentration range of 20 to 90% H_2O_2. Compatibility tests indicated that the addition of H_2O_2 in concentrations between 0.1 and 10% inhibits corrosion and rusting of steel for periods of time which are dependent upon the peroxide concentration. In the case of Al sheet, corrosion of the metal was apparent in 1 day when the lowest concentration of H_2O_2 (0.1%) was used; at 10% H_2O_2 however, corrosion stopped completely.

PB 149 217 $2.60

Materials Research Corp., Yonkers, N. Y.
EMBRITTLEMENT OF NaCl BY SURFACE COMPOUND FORMATION, by W. H. Class, E. S. Machlin, and G. T. Murray. Technical rept. no. 2 on Contract Nonr-2432(00). 8 July 60, 29p. 12 refs. MRC no. R168; AD-240 048.

DESCRIPTORS: *Sodium compounds, *Chlorides, Single crystals, Fracture (Mechanics), Mechanical properties, Surfaces, Chemical impurities, Oxidation, Perchlorates, Aging, *Crystals, Gases, Brittle materials, Lattices.

The embrittling effects of oxygen, ozone, nitrogen, air, and surface residues, on NaCl has been investigated. The embrittlement by ozone and oxygen was found to be associated with the formation of a $NaClO_3$ surface compound. In these cases the initial crack that was responsible for fracture (in a bend test) always nucleated at the corners between the tension and side faces. The behavior of air was very erratic and on certain days did not produce embrittlement. During these periods, a short exposure to air of ozonated crystals would eliminate the previously induced embrittlement. (Author)

MRC-195 $0.75

Materials Research Corp., Yonkers, N. Y.
PERMEABILITY OF CLADDING MATERIALS TO INERT GASES, by G. T. Murray. Second annual rept. on Contract AT(30-1)-2286. 15 Nov 60, 32p.

PB 155 074 $10.50

Montana State [U.] Bozeman.
THE ELECTRIC MOMENTS AND SOME OTHER PHYSICAL PROPERTIES OF $VOCl_3$, VCl_4 AND THE SIMPLE ALKYL ORTHOVANADATES, by Frederick Cartan. Doctoral thesis. [Rept. on Contract DA 04-200-ORD-377]. June 59, 131p. 59 refs. AD-220 516.

DESCRIPTORS: *Vanadates, *Vanadium compounds, Chlorides, Oxychlorides, Dipole moments, Physical properties, Alkyl radicals, Esters.

$VOCl_3$, VCl_4, and several of the simple alkyl esters of orthovanadic acid were prepared. Their densities, indices of refraction, and dielectric constants were measured. The alkyl esters were found to be monomeric in benzene. Solution values for the electric moments of these compounds were measured. The solvent for the alkyl orthovanadates was benzene; for the halides it was CCl_4. The electric moments of all compounds except VCl_4 and tert-butyl orthovanadate were calculated by using the Onsager equation. The observed solution electric moments and the Onsager moments are: (in debyes) vanadium oxytrichloride ---- 0.31, 0.39; vanadium tetrachloride ---- 0, --; ethyl orthovanadate ---- 1.18, 1.16; propyl orthovanadate ---- 1.15, 1.11; isopropyl orthovanadate ---- 1.23, 1.40; butyl orthovanadate ---- 1.13, 1.09; isobutyl orthovanadate ---- 1.10, 1.10; sec-butyl orthovanadate ---- 1.01, 1.30; tert-butyl orthovanadate ---- 1.16, --; and tert-amyl orthovanadate ---- 1.11, 1.22. These observed electric moments strongly indicate that the V-O bond moment is low. This can be explained by the assumption of π bonding in this linkage. It is suggested that an equilibrium exists between the monomer and a polymer and that the color observed in several of the esters is due to the polymeric form. IR, near IR visible, and n.m.r. proton spectra are presented.

PB 155 075 $1.60

North Dakota U., Grand Forks.
THE DISSOCIATION OF NITROGEN TETROXIDE AND NITROGEN DIOXIDE, by E. D. Coon, William R. Streib and others. Final rept. on Contract DA 11-022-ORD-1676. [1959] 18p. 4 refs. AD-220 479.

DESCRIPTORS: *Nitrogen compounds, *Dioxides, *Tetroxides, Oxides, Decomposition, Chemical equilibrium, Temperature, Chemical reactions, Spectrographic analysis.

An investigation was made of the temperature factors involved in the equilibria of the reactions: (I) $N_2O_4 \rightleftharpoons 2NO_2$ and (II) $2\ NO_2 \rightleftharpoons 2NO + O_2$. Quartz gas cells were filled with N_2O_4 and placed, together with an air-filled reference cell, in an electrically-heated oven which replaced the cell compartment of a DU spectrophotometer. Readings were made over a temperature range of 0° to 650°C at wavelengths from ultraviolet to 7000A. The data indicated that dissociation as shown by reaction. could be correctly calculated from pressure data only up to 60°C; reaction II began at higher temperatures. Reaction I was not complete until 250° to 300°C. Above 300°C, NO_2 decomposed at a rate calculated from pressure changes.

PB 150 134 $1.10

Noyes Chemical Lab., U. of Illinois, Urbana.
PROTON MAGNETIC RESONANCE STUDIES OF NON-STOICHIOMETRIC TITANIUM HYDRIDE, by B. Stalinski, C. K. Coogan, and H. S. Gutowsky. Technical rept. no. 31 on Contract Nonr-1834(13). 13 July 60, 5p. 9 refs. AD-241 460.

DESCRIPTORS: *Nuclear magnetic resonance, Protons, *Titanium compounds, *Hydrides, Hydrogen, Diffusion, Temperature, Microwave spectroscopy.

Proton magnetic resonance experiments were conducted on titanium hydride ranging in composition from $TiH_{1.61}$ to $TiH_{1.97}$. The temperature dependence of the line shape indicated that the H diffusion occurs by a vacancy mechanism at a rate linearly dependent on the concentration of vacancies. The proton resonances of all samples exhibited a large negative Knight shift of the order of -3×10^{-4}. The suggestion is made that these shifts result from an electron exchange interaction which pairs the spins of electrons in the conduction band with the spins of electrons centered on protons. The proton resonance shift was measured at room temperature for all specimens and from -95° to 190°C for the 2 extreme compositions. The shifts lay in the range -0.01 for $TiH_{1.607}$ to about -0.032 % for $TiH_{1.969}$. In these 2 extreme specimens, the shift showed a dependence upon temperature similar to that of bulk susceptibility; the shifts for $TiH_{1.969}$ exhibited an anomaly at about 13°C as does the bulk susceptibility.

PB 150 135 $1.60

Noyes Chemical Lab., U. of Illinois, Urbana.
TEMPERATURE DEPENDENCE OF THE PROTON SPIN-LATTICE RELAXATION TIME IN LIQUID BUTYL ALCOHOLS, by Robert A. Bernheim, H. S. Gutowsky, and Ian J. Lawrenson. Technical rept. no. 32 on Contract Nonr-1834(13). 27 July 60, 19p. 12 refs. AD-241 422.

DESCRIPTORS: Protons, *Nuclear magnetic resonance, *Butanols, *Paramagnetic resonance, Atomic structure, Chemical bonds, Thermodynamics, Nuclear spins, Dielectric properties, Molecular structure, Temperature.

The proton T_1 has been measured by rf pulse methods at 20 Mc/sec for n-butyl, iso-butyl, sec-butyl, and tert-butyl alcohol over their liquid range. The observed temperature dependences of T_1 correspond to activation energies of 3.9, 4.7, 5.2 and 7.3 kcal/mole, respectively, for the n, iso, sec, and tert alcohols. The T_1 results and a comparison of them with known dielectric dispersion data indicate that the spin-lattice relaxation is produced by molecular motions which are restricted by hydrogen bonding and steric effects to reorientations mainly about the C-O and C-C bonds of the heavy atom skeleton. (Author)

PB 155 158 $13.50

Sprague Electric Co., North Adams, Mass.
SOLID ELECTROLYTE BATTERY SYSTEMS, by Donald M. Smyth. Final rept. 1 June 56-31 Aug 57, on Contract DA 36-039-sc-72349. [1957] 193p. 41 refs. AD-149 502.

DESCRIPTORS: *Electrolytes, *Electrochemistry, *Electrolytic cells, Materials, Stability, Design, Tests, Solids.

The goal of this contract has been to carry out fundamental studies leading to the development of a practical

long-life battery of the solid electrolyte type. This goal has been attained by the development of the $Ag/AgCl/Cl_2$ cell system in which a tetrachloroiodide salt serves as a low pressure source of chlorine vapor. The assembly of this system into a miniature can-shaped cell results in a unit of high stability with only a slight sacrifice in volume.

PB 150 533 $3.60

Stanford Research Inst., Menlo Park, Calif.
DIFFUSION AND HETEROGENEOUS REACTION. V. MEASUREMENT OF THE KINETICS OF HYDROGEN ATOM RECOMBINATION ON SURFACES, by Bernard J. Wood and Henry Wise. Rept. on Proj. Squid, Contract Nonr-1858(25). Jul 60, 38p. 45 refs. Technical rept. SRI-7-P; AD-242 458.

DESCRIPTORS: Hydrogen, Atoms, *Recombination reactions, Diffusion, Catalysts, Surface properties, *Palladium catalysts, Palladium alloys, Gold alloys.

A theoretical analysis is applied to an experimental probe technique in such a manner that the absolute catalytic activities for atom recombination of the surfaces in the system may be ambiguously evaluated. During measurements of heterogeneous atom recombination, Pd and a 62 at-% Au-Pd alloy were identical in their catalytic efficiency, both in the absolute value of the recombination coefficient and in the absence of an activation energy. Differences were observed in the value of the recombination coefficients in a series of transition elements, such as that of Ti relative to that of Ni, and the high activity of nontransition metals, such as Al. The presence of large amounts of hydrogen in the solid enhances the recombination process. The presence of atomic H in the gas appears to alter completely the sorption characteristics of the metal surface. The relatively high catalytic activity for Au which chemisorbs molecular H only at elevated temperatures, may be attributed to the presence of gaseous atomic H which transcends the energy barrier for dissociative chemisorption. Another effect of the presence of dissolved gas in a solid is the perturbation of the lattice dimensions by the occluded species. Whether such occlusions take the form of interstitial metal-H compounds or of H accumulation in "rifts" and other lattice dislocations has not been settled. However, there is evidence for the displacement of metal lattice atoms on absorption of H. Such distortions of the crystal may lead to geometric dispositions of the lattice and the formation of additional electronic states which favor the recombination reaction.

PB 155 439 $2.60

Stanford Research Inst., Menlo Park, Calif.
A LABORATORY FOR INVESTIGATING THE PROPERTIES OF SOLUTIONS AT HIGH TEMPERATURE AND PRESSURE, by W. J. Fredericks. Scientific rept no. 1 on Contract AF 19(604)5697. 30 Jan 61, 25p. 23 refs. SRI Project no. SU-2836; AFCRL-51; AD-253 332.

DESCRIPTORS: *Laboratories, Laboratory equipment, High temperature research, High pressure research, *Chemical engineering, Design, Determination, Safety, Measurement, *Crystals, Growth, High pressure laboratories, Pressure vessels, *Solutions.

A laboratory for the study of high pressure solution chemistry and for growing crystals from supercritical solutions is described. A unique safety barricade of the "infinite volume design" has been developed. The barricade occupies a minimum of laboratory floor space; it has been designed so that the high pressure system can be assembled before placing it in the barricade; and it allows high pressure studies to be conducted in a laboratory occupied on four sides. In addition, the barricade wall thickness can be easily varied to accommodate more hazardous experiments which require slightly smaller reaction vessels. The opening resulting from the infinite volume design also makes the barricade easily accessible for installation of additional electrical or mechanical facilities. (Author)

PB 149 093 $1.10

Washington U , Seattle.
BIS(PENTAFLUOROSULFUR) PEROXIDE, by Claude I Merrill and George H. Cady. Technical rept. no. 27 on Contract Nonr-477(16). 1960, 10p. 9 refs. AD-240 127.

DESCRIPTORS: *Sulfur compounds, Fluorides, *Peroxides, Physical properties, Chemical properties, Synthesis, Oxidizers.

Preparation of bis(pentafluorosulfur) peroxide, $(SF_5)_2O_2$, has been achieved by allowing pentafluorosulfur hypofluorite (SF_5OF) to react with thionyl fluoride (SOF_2) or with thionyl tetrafluoride (SOF_4) and by subjecting SF_5OF to ultraviolet light. Bis(pentafluorosulfur) peroxide is a dense, colorless liquid that boils at 49.4°C and freezes at -95.4°C. It reacts very slowly with base and shows oxidizing character by slowly producing free iodine when contacted with potassium iodide solution. Thermal decomposition of $S_2O_2F_{10}$ results ultimately in the products SF_6, SO_2F_2, and O_2, although SOF_4 is one of the materials produced initially. Chemical, mass spectrographic, infrared and nuclear magnetic resonance data contribute evidence consistent with a peroxide structure for this substance. (Author)

EARTH SCIENCES

PB 155 196 $1.10

Pennsylvania State U. Mineral Industries Experiment Station, University Park.
MODEL STUDIES OF SEISMIC ENERGY DISTRIBUTION AROUND DIFFERENT TYPES OF SOURCE. Quarterly rept. no. 2 on Contract AF 19(604)7383. 28 Feb 61, 9p. AD-252 689.

DESCRIPTORS: *Seismic waves, Energy, Distribution, *Earth models, Earthquakes, Simulation, Sources.

Data are being sought thru model studies on how the characters of seismic pulses vary with azimuth for different types of source and for different simulated geologic environments in the vicinity of the source. Source motions are simulated by applying pulses to the model with one or a system of piezoelectric crystal

transducers. In the second group of experiments, actual fault displacements are created in the model by freezing a stress in the model, then causing the model to break at a predetermined place. Frozen water acts as a cement and is thawed to allow the yielding.

PB 154 162 $8.60

Weather Bureau, Washington, D. C.
THE DISTRIBUTION OF TEMPERATURE LAPSE RATES OVER THE ARCTIC REGION [AND] SURFACE TEMPERATURE REGIME IN GREENLAND, by P. Putnins, M. Choate, and Nina A. Stepanova. Quarterly rept. for 1 Feb-30 Apr 60 on Contract DA 3-99-00-500; MIPR no. R-65-8-99831SC-03-91. 98p.

DESCRIPTORS: *Meteorological data, *Greenland, *Climate, Temperature, Arctic regions, Humidity, Surface temperatures, Meteorology.

Climatology and Meteorology

PB 155 221 $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
METHODS FOR THE EVALUATION OF THE GREEN'S FUNCTION ARISING IN THE LINEAR BARTOTROPIC NUMERICAL WEATHER PREDICTION THEORY, by Louis Berkofsky. Nov 60, 25p. 5 refs. GRD Research Notes no. 44; AFCRL-TN-60-641; AD-252 560.

DESCRIPTORS: *Weather forecasting, Theory, Test methods, Integral equations, Differential equations, *Green's function

The mathematical development leading to two different forms, a differential and an integral form, for representing the Green's function for the prognostic equation is described. A detailed description of the calculations leading to the tabulated Green's function is presented. (Author)

PB 154 886 $4.60

Air Force Cambridge Research Labs., Bedford, Mass.
TOPOGRAPHIC CHARTS AT ONE-DEGREE INTERSECTIONS FOR THE ENTIRE EARTH, by L. Berkofsky and E. A. Bertoni. Sep 60, 48p. 3 refs. GRD Research Notes no. 42; AFCRL-TN-60-615; AD-250 584.

DESCRIPTORS: Earth, *Terrain, Height finding, Maps, Meteorological data, *Weather forecasting.

This rept. includes: Mean Topographic Charts for the Entire Earth, by Louis Berkofsky and Eugene A. Bertoni, pub. in Bull. of the American Meteorological Society 36:350-353, Sep 55.

Charts of average terrain heights at 1-degree latitude-longitude intersections over the entire earth are presented. These are deemed useful to numerical forecasters as well as synoptic meteorologists for studies of relatively small-scale meteorological phenomena (such as, cyclones, mountain waves, and certain micrometeorological problems). (Author).

PB 154 271 $6.60

MacDonald Physics Lab., McGill U. (Canada).
WEATHER-RADAR ATTENUATION ESTIMATES FROM RAINGAUGE STATISTICS, by P. M. Hamilton and J. S. Marshall. Rept. on Contract AF 19(604)2065. Jan 61, 69p. 11 refs. Stormy Weather Group Scientific rept. MW-32; AFCRL-TN-60-658; AD-250 196.

DESCRIPTORS: *Meteorological radar, *Precipitation, Intensity, Distribution, Radar echo areas, Attenuation, Statistical data, Canada, *Radar interference.

The attenuation of radar weather signals by intervening precipitation is difficult to estimate from the radar records themselves. Rainfall rates observed at a point in the path of a storm approximate those along a section through the storm; this is the basis in estimating attenuation frequencies at wavelengths 3 cm and 5.7cm for a summer's storms at Montreal. Statistically, the amount of attenuation along a radar path varies greatly with the intensity of the target rain; attenuation increases with target intensity. This is mostly attributable to attenuation by rain very close to the target rain, and in the same shower. As a result, areas of intense rain are much reduced and distorted, although the maximum intensity values of showers come closer to the true maxima than was expected (half the maxima were down by 4 db and one in ten by 11 db). Although attenuation at 5.7 cm is less troublesome than at 3 cm, truly quantitative operation demands 10 cm. (Author)

PB 154 141 $5.60

Marine Lab., U. of Miami, Coral Gables, Fla.
STUDIES OF THE EVOLUTION AND MOTION OF RADAR ECHOES FROM HURRICANES, by H. V. Senn, H. W. Hiser, and R. D. Nelson. Final rept. 1 July 59-30 June 60, on Contract Cwb-9727. Aug 60, 58p. 17 refs. ML 60258; AD-249 479.

DESCRIPTORS: *Hurricanes, Motion, Hurricane tracking, *Radar tracking, Radar echo areas, Analysis, Meteorological radar, Tropical cyclones.

During the past two years, radar echo vector motion was studied for over 3,000 echo trajectories from hurricanes Edna 1954, Connie, Diana and Ione 1955, Audrey 1957, Daisy and Helene 1958, and Debra 1959. The preliminary results of the analysis of about half of these data, which were presented last year, are verified in most respects but subject to important modification in the region of the wall cloud. Progress on continuing attempts to mathematically describe echo and spiral band motion and to relate that motion to the dynamics of the hurricane is also discussed. Finally, a unique feature of several similar Florida hurricanes is presented which may prove operationally useful in determining the direction of motion of these storms when other information is lacking. (Author)

PB 154 059 $4.60

Massachusetts Inst. of Tech., Cambridge.
ON THE MAINTENANCE OF KINETIC ENERGY OF THE LARGE-SCALE STATIONARY DISTURBANCES IN THE ATMOSPHERE, by Takio Murakami. Scientific rept. no. 2 on Planetary Circulations Project, Contract AF 19(604)6108. Sep 60, 43p. 19 refs. AFCRL-TN-60-812; AD-249 574.

DESCRIPTORS: *Atmosphere, *Convection, Wind, Energy, Thermodynamics, Mathematical analysis, Northern hemisphere, Air mass analysis, Turbulence.

The rate of transfer of kinetic energy among the time-mean zonal current, the time-mean meridional current, the stationary disturbances, and the transient eddies, together with the release of potential energy into kinetic energy of the stationary disturbances, is measured by the use of the observed wind for the entire year 1950. It is found that the kinetic energy of the stationary disturbances is maintained primarily by the baroclinic process of sinking of cold air and ascending of warm air against the steady drain through viscous effects and through transfer to the time-mean zonal current, the time-mean meridional current and the transient eddies. The available potential energy of the stationary disturbances is partly supplied by the effect of condensation heating. (Author)

PB 154 060 $5.60

Massachusetts Inst. of Tech., Cambridge.
SOLUTION OF THE NONLINEAR EQUATIONS OF CELLULAR CONVECTION AND HEAT TRANSPORT, by Hsaio-lan Kuo. Scientific rept. no. 3 on Planetary Circulations Project, Contract AF 19(604)6180. Oct 60, 53p. 8 refs. AFCRL-TN-60-813; AD-249 575.

DESCRIPTORS: *Atmosphere, *Convection, Heat transfer, Analysis, Non-linear differential equations.

There is no doubt that the nonlinear solution converges more rapidly and is valid over a much larger range of the imposed temperature difference than previous solutions. Interesting features of the convective motion are revealed, such as the concentration of the mean temperature gradient in the boundary layers, the creation of a deep mean isothermal layer in the main body of the fluid, and the mushroom-like spreading of the warm-ascending and cold-desending currents. This solution is based on the assumption that convection starts at the critical Rayleigh number in the form of the fundamental mode and proceeds to create higher modes through the nonlinear cascade effect. To reach the equilibrium steady state, the solution can be unique only under these stated conditions, and only when this solution converges and is stable. The last qualification is necessary because if the solution represents an unstable state, then the motion must be replaced by another motion which is stable for the given value. (Author)

PB 155 765 $7.60

McGill U. (Canada).
ATLAS OF SURFACE TEMPERATURE FREQUENCIES FOR EURASIA, by J. N. Rayner. Rept. on Contract DA 19-129-qm-1447. Feb 61, 80p. 4 refs. Arctic Meteorology Research Group Pub. in Meteorology no. 39.

DESCRIPTORS: *Meteorological data, *Temperature charts, Asia, Europe.

PB 155 764 $8.10

McGill U. (Canada).
ATLAS OF SURFACE TEMPERATURE FREQUENCIES FOR NORTH AMERICA AND GREENLAND, by J. N. Rayner. Rept. on Contract DA 19-129-qm-1447. Jan 61, 88p. 4 refs. Arctic Meteorology Research Group Pub. in Meteorology no. 33.

DESCRIPTORS: *Meteorological data, *Temperature charts, Greenland, North America.

PB 149 743 $4.60

New York U. Coll. of Engineering, N. Y.
A VERTICALLY INTEGRATED WET, DIABATIC MODEL FOR THE STUDY OF CYCLOGENESIS, by Jerome Spar. Scientific rept. no. 1 on Cyclone Development, Contract Nonr-285(09), July 60, 45p. 20 refs. AD-240 577.

DESCRIPTORS: *Atmosphere models, Weather forecasting, Cyclones, Sources, *Air mass analysis, Meteorological data, Oceanographical data, Programming, Numerical analysis.

A vertically integrated model was designed for investigating the effects of heat of condensation, and heat and water vapor flux from the sea on cyclone development. The vertical distributions of wind and vertical velocity are derived from a specified vertical temperature profile. Evaporation and heat flux from the sea are computed semi-empirically. The vertical humidity profile is specified empirically as a function of the precipitable water. The equations were integrated on the IBM 704 computer to produce hourly forecasts of geopotential height at 1000 and 500 mb, precipitable water, vertical velocity, and cumulative precipitation on a 550 point grid. The model is semi-ageostrophic, in the sense that the divergent wind can be computed from the vertical motion. However, only geostrophic forecasts were carried out thus far. (Author)

Geodesy

PB 154 885 $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
TANGENTIAL VELOCITY MEASUREMENTS. AN INDEPENDENT APPROACH TO GEODESY, by Bruce C. Murray and Nannielou H. Dieter. Sep 60, 24p. 8 refs. GRD Research Notes no. 41; AFCRL-TN-60-612; AD-250 863.

DESCRIPTORS: *Geodesics, Geodetic data, Earth, Radio astronomy, Surface properties, Velocity, Measurement, Vector analysis, Geodetic astronomy.

There exists an independent and theoretically at least, feasible check of the Astro-geodetic and Gravimetric methods - namely, to exploit the simple, exact relationship between position on the earth's surface and the tangential velocity vector at that point due to the earth's daily rotation. The magnitude of the tangential velocity vector is a function solely of sidereal rate, geocentric latitude, and geocentric radial distance to the point, whereas the inertial direction of the vector depends only on longitude and sideral time. Consequently, precise measurements of both magnitude and direction of the vector could be compared with computed values based on the presumed geocentric coordinates of the station. Statistically significant differences would be directly relatable to corrections of the datum in question except for an uncertain translation component parallel to the polar axis. A proposed experimental approach which, it is hoped, will become capable of geodetic precision within, perhaps, five years, is to measure diurnal frequency variation of 21-cm line radiation caused by the earth's daily rotation. (Author)

PB 155 361 $11.50

Harvard Coll. Observatory, Cambridge, Mass.
SOURCES OF AEROGRAPHIC COORDINATES 1909 - 1954, by G. de Vaucouleurs and R. Wright. Scientific rept. no. 2 on Contract AF 19(604)7461. 25 Feb 61, 159p. 30 refs. AFCRL-257; AD-253 186.

DESCRIPTORS: Surface properties, *Mapping, Mars, Geodetic data, Corrections, Tables, Maps.

All published aerographic coordinates measured since 1909 were compared and cross-identified after a thorough search for usable data was made in the existing Mars literature. The collected data for 586 points of Mars' surface were found to contain various errors of measurement and identification, which were corrected in the individual notes, and which were taken into account in compiling a basic master map and list of points. (Author)

PB 155 064 $2.60

Milan U. (Italy).
ANALYTICAL AEROTRIANGULATION BY MEANS OF AUXILIARY DATA, by Guiseppe Inghilleri. Scientific note no. 1 on Contract AF 61(052)94. Feb 59, 23p. RADC-TN-59-127; AD-213 585.

DESCRIPTORS: *Aerial reconnaissance, Instrumentation, Aerial photography.

The methods for computing the analytical aerial triangulation are considered with the auxiliary data supplied by the solar periscope, gyroscope, and statoscope. (Author)

Geography

PB 149 356 $4.60

Sacramento State Coll., Calif.
GEOGRAPHY OF INDIAN COASTS, by David E. Sopher. Annual summary rept. for 1959 on Contract Nonr-2329(00). 1960, 42p. 2 refs. AD-240 075.

DESCRIPTORS: *Geography, *Economic conditions, Culture, *India, Commerce.

Field work during the summer of 1959 consisted of investigations in Portuguese India and a brief look at the Makran Coast and hinterland west of Karachi. The work accomplished provided a very useful acquaintance with four separate pieces of the coast, such that the characteristics of the strand and the communities inhabiting it along intervening stretches may be satisfactorily interpolated from information in the literature. The longer part of the summer work period was spent in Goa.

PB 149 357 $1.60

Sacramento State Coll., Calif.
GEOGRAPHY OF INDIAN COASTS, by David E. Sopher. Final rept. on Contract Nonr-2329(00). [1960] 11p. AD-240 506.

DESCRIPTORS: *Geography, *Culture, *India, Commerce, Boats.

The central theme of the research reported here is the relationship between environment and culture in a special situation, that of location on the strand in the Indian culture region. Of special interest in this investigation was the form of boats used in sea fishing and their distribution in relation to environmental and cultural geographic features.

Geology

PB 149 228 $4.60

California U., Berkeley.
COASTAL LAND FORMS OF CENTRAL PANAMA, by Yi-fu Tuan. Rept. on Contract Nonr-222(11). 1960, 48p. 22 refs. AD-239 568.

DESCRIPTORS: *Beaches, Swamps, *Erosion, Panama, Tidewater.

PB 149 330 $6.60

Massachusetts Inst. of Tech., Cambridge.
RESEARCH ON THE PHYSICAL PROPERTIES OF MARINE SOILS. Rept. for 19 Aug 59-19 July 60 on Contract Nonr-1841(29). July 60, 65p. 54 refs. AD-240 049.

DESCRIPTORS: *Soils, *Clays, *Vermiculite, *Montmorillonite, *Sedimentation, Physical properties, Mechanical properties, Time, Temperature, Pressure.

A literature survey was made in an attempt to correlate the geological factors of clay mineral formation, transportation, and deposition with the engineering properties of the resultant clay deposits, with emphasis on marine clays. An experimental investigation was made to determine the effects of rapid mineralogical changes on the engineering properties of clay soils in a marine environment, and to study the results of potassium fixation with controlled salt environments consisting of pure NaCl and KCl. (See also PB 150 862)

Oceanography

PB 149 779 $6.60

California U., Berkeley.
THE SLOPING BEACH PROBLEM, by R. Sherman Lehman. Technical rept. no. 11 on Contract Nonr-222(62). July 60, 67p. 17 refs. AD-240 690.

DESCRIPTORS: *Water waves, *Beaches, Mathematical analysis, *Operators (Mathematics), Differential equations, Numerical methods and procedures.

The problem of 3-dimensional water waves over beaches with slope angles $\pi p/2q$ is studied, where p is a positive odd integer relatively prime to the positive integer q. A generalization of Lewy's method (Bull. Am. Math. Soc. 52:737-775, 1946) for 2-dimensional waves is used. Consideration is given to the question of determining all solutions of the boundary value problem satisfying a boundness condition at infinity and a condition limiting the type of singularity at the origin. The method of studying the uniqueness question is based on the determination of a linear differential operator with constant coefficients.

PB 155 122 $3.60

Lamont Geological Observatory, Palisades, N. Y.
PRELIMINARY RESULTS OF INVESTIGATIONS ON ARCTIC DRIFT STATION CHARLIE, by William J. Cromie. Scientific rept. no. 3 on Contract AF 19(604)2030. Oct 60, 35p. 10 refs. AFCRC-TN-60-259; AD-252 176.

DESCRIPTORS: *Oceanographical data, Ocean bottom, Sedimentation, *Geological survey, Marine biology, Sound ranging, Seismic waves, Photographic analysis, Arctic regions.

Station Charlie, established on the pack ice of the Arctic Basin, drifted in an east-west line across a shallow peninsula of the Chukchi shelf during July-August, 1959. Continuous soundings were taken within an accuracy of 1M across the feature and in adjacent deep water. A bathymetric profile was constructed and the angles of slope computed from seismic reflections. Twenty-two piston cores were taken, ranging in penetration to 250 cm. Over 100 bottom photographs, made on the shelf and in deep water, show rocks and an abundance of life. Six trawls brought to the surface geological and biological specimens. An attempt at dating by radiocarbon analysis of pelagic forams is in process. Work in seismology and magnetics was done. Reflection techniques were used for determinations of dip and strike of bottom sediments. Studies were made of long range sound transmission by seismic means. Both relative and continuous absolute values of the magnetic field were measured. Records were taken during a magnetic storm and solar flare disturbance. A vertical seismometer was installed on the pack ice and successfully recorded at least one earthquake. Small variations in atmospheric pressure were recorded continuously on a microvariobarograph. (Author)

PB 150 630 $2.60

Marine Physical Lab., Scripps Institution of Oceanography, San Diego, Calif.
MPL EXPERIMENTAL RUM, by Victor C. Anderson. Rept. no. 7 on Artemis, Contract Nonr-266(66) and rept. on Contract Nonr-2216(07). 1 July 60, 26p. SIO Ref. 60-26; AD-242 720.

DESCRIPTORS: *Underwater equipment, *Underwater television systems, Instrumentation, Design, Oceanography, Vehicles, Tracked vehicles, Electronic circuits, Sonar.

An experimental Remote Underwater Manipulator constructed at the Marine Physical Laboratory is described. Features of the design which permit operation at deep submergence in the ocean over 5 miles of small coaxial cable are discussed. Pertinent electronic circuits are shown and their general operation outlined. (Author)

PB 149 532 $2.60

Massachusetts U., Amherst.
PHYSIOGRAPHY AND PHOTO INTERPRETATION OF COASTAL SAND DUNES, by H. T. U. Smith. Final rept. on Contract Nonr-2242(00). July 60, 27p. AD-240 321.

DESCRIPTORS: *Beaches, Sand, Aerial photographs, Geography, Plants.

Contents:
General survey of coastal dune areas
Dunes of non-vegetated areas
Dunes of vegetated coasts
Special cases of eolian sands in coastal regions
Dunes influenced by composition of sand
Utilization of coastal dune areas
Photo interpretation of coastal dunes

PB 149 840 $3.60

Texas A. and M. Coll., College Station.
OCEANOGRAPHY AND METEOROLOGY OF THE GULF OF MEXICO, by Hugh J. McLellan. Annual rept. 1 July 60, 36p. 8 refs. Reference 60-11A; AD-240 605.

DESCRIPTORS: *Oceanography, *Meteorology, Gulf of Mexico, Ocean currents, Surface properties, Ocean waves, Sedimentation, Tides, Thermistors.

The following summaries of work carried out in the Gulf of Mexico and adjacent waters are presented: Surface layer studies; Automatic weather buoy studies; Marine geophysics; Meanders in a wide current in a stratified ocean; Forecasting of ocean waves generated by moving wind systems in deep and shallow water; Clay mineralogy of marine sediments and sedimentary processes; Tidal motion in the Gulf of Mexico; Field studies of the currents of the southeastern gulf; Analysis of serial data taken in the southeastern gulf; Corals and sediments of Cayo Arenas Yucatan, Mexico; Towed temperature recorder; A thermistor string for AN/SMT-1 Weather Buoy and descriptive oceanography of the Gulf of Mexico. (Author)

Physics of the Atmosphere

PB 154 880 $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
AIDS FOR COMPUTING STRATOSPHERIC MOISTURE, by Murray Gutnick. Jan 61, 21p. 7 refs. GRD Research Notes no. 50; AFCRL-203; AD-251 608.

DESCRIPTORS: *Stratosphere, Humidity, *Moisture, Measurement, Mixtures, Meteorological charts, Tables.

Results of experiments in measuring stratospheric humidity were presented in many different units. This analysis contains charts and tables to facilitate the time-consuming conversion of these various moisture parameters to any desired common base. (Author)

PB 154 881 $2.60

Air Force Cambridge Research [Labs.] Bedford, Mass.
A DISCUSSION OF THE CALDER EQUATION FOR DIFFUSION FROM A CONTINUOUS POINT SOURCE, by William P. Elliot. May 60, 21p. 7 refs. GRD Research Notes no. 31; AFCRC-TN-60-298; AD-240 621.

DESCRIPTORS: *Adiabatic gas flow, *Gas diffusion, Determination, Mathematical analysis, Partial differential equations, *Atmosphere, Wind, Particles, Airborne, *Contamination.

The derivation of the Calder equation is indicated and discussed. Using the diffusion data taken during the Prairie Grass program, the ability of the equation to predict the observed values of (1) vertical variation of concentration, (2) the downwind peak concentration, and (3) the crosswind integrated concentration was evaluated. The equation was found to give peak concentrations which are too high and vertical and lateral decreases of concentration that are also too high. (Author)

PB 155 469 $5.60

Ionosphere Research Lab., Pennsylvania State U., University Park.
RECOMBINATION PROCESSES IN THE IONOSPHERE, by A. P. Mitra. Scientific rept. no. 145 on Ionospheric Research, Contract AF 19(604)3875. 1 Feb 61, 54p. 50 refs. AFCRL-267; AD-253 072.

DESCRIPTORS: *Ionosphere, *Ionization, *Electrons, *Ions, Recombination reactions, Dissociation.

The various loss processes operating in the ionosphere and contributing to the effective recombination coefficient are surveyed. Values of the coefficient are given for different heights under various conditions. Changes in the coefficient at night are discussed. Values determined during eclipses and during disturbed conditions such as conditions prevailing during magnetic disturbances and during solar flares are reported, and their implications are examined. (Author)

PB 151 399-3 $1.50

National Bureau of Standards, Boulder, Colo.
MEAN ELECTRON DENSITY VARIATIONS OF THE QUIET IONOSPHERE. 3, MAY 1959, by J. W. Wright, L. R. Wescott, and D. J. Brown. Mar 60, 54p. 5 refs. Technical note no. 40-3.

DESCRIPTORS: *Ionosphere, Analysis, *Electrons, Density, Determination.

The results of this program for one month are illustrated graphically. (See also PB 151 399-2)

PB 155 781 $3.60

National Research Labs., Ottawa (Canada).
ATMOSPHERIC TURBULENCE ENCOUNTERED BY A BRITANNIA AIRCRAFT ON POLAR AND NORTH PACIFIC ROUTES, by R. T. Sewell. Mar 61. 36p. Aeronautical rept. LR-301; NRC no. 6257.

DESCRIPTORS: *Atmosphere, Arctic regions, *Turbulence, Gusts, Analysis, Vertical gust recorders, Aircraft, Meteorology.

V-G-H records were obtained from a Britannia 314 aircraft operating on regular scheduled service between Vancouver and Amsterdam (Polar route) and Vancouver and Hong Kong (North Pacific route). Records were obtained over a period of 186 flying hours, between May and December 1960. Since the collection of data is still proceeding, the results presented in this report should be considered as of an interim nature only. Certain observations have been made, but at this stage no definite conclusions have been drawn, as the amount of data available is not considered sufficient to provide a true statistical representation of conditions. (Author)

PB 154 360 $5.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
SOME PROBLEMS IN TRAFFIC DELAY, by George H. Weiss and Alexei A. Maradudin (Westinghouse Research Labs.). Rept. on Contract AF 18(600)1315. Dec 60, 60p. 14 refs. Technical note BN-224; AFOSR-125; AD-250 499.

DESCRIPTORS: *Traffic, Statistical distributions, *Vehicles, Operations research, Statistical processes.

An analysis deals with several variations of the problem of the delay time of a driver waiting at a stop sign for a gap in traffic large enough to either allow him to cross the road or merge with a lane of moving traffic. It is assumed that the headway distribution of the traffic on the main highway is known and that the waiting driver assigns a probability of crossing to a gap of length t . We calculate all of the relevant statistics are calculated for the distribution of delay time using an integral equation formulation. The case of the impatient driver whose gap acceptance criterion changes with the number of passing cars is also studied. The concept of the transparency of a highway is introduced, i. e., the percentage of time that a waiting driver will report a non-blocking gap on the highway. A general formula is given for this quantity in the limit of long times of observation. (Author)

PB 153 974 $1.60

Naval Research Lab., Washington, D. C.
THE INFLUENCE OF TEMPERATURE ON THE VISCOSITY AND DRAINAGE RATES OF MECHANICALLY PRODUCED FIRE-FIGHTING FOAMS, by E. J. Jablonski. Interim rept. 14 Mar 61, 12p. 11 refs. NRL rept. 5598; AD-254 513.

DESCRIPTORS: *Foams, Physical properties, Temperature, *Fire extinguishers, Stability, Reduction, Effectiveness, Fires, Viscosity.

Within the past twenty years, the use of mechanically produced fire-fighting foams has increased tremendously. Research studies wherein these aqueous foams were generated using solution temperatures of 40°, 70°, and 100°F have revealed some interesting relationships involving their physical characteristics. Special equipment was utilized for generating foams of various expansion ratios and for obtaining measurements of the stability and viscous properties of these foams. It was found that as the solution temperature is lowered from 100° to 40°F, less energy (pressure) is required to produce a foam of practically any given drainage time and apparent viscosity value within the 4 to 12 expansion range. It is recommended that foam solution temperatures above 100°F not be used in foam generating equipment producing foams in the expansion 4 range because of the rapid decrease in foam stability and reduction in fire-extinguishing effectiveness. (Author)

PB 154 887 $3.60

Air Force Cambridge Research Labs., Bedford, Mass.
COSMIC-RAY MONITORING OF THE MANNED STRATOLAB BALLOON FLIGHTS, by Herman Yagoda. Sep 60, 32p. 7 refs. GRD Research Notes no. 43; AFCRL-TN-60-640; AD-250 864.

DESCRIPTORS: Balloons, Manned, *Photographic emulsions, *Cosmic rays, Nuclei, *Particle trajectories, Skin, Monitors, *Stratosphere, Sunspots, Intensity, Measurement.

New observations made on emulsion blocks and skin monitors during Stratolab flights III and IV are described. A re-evaluation of the results of the Manhigh II flight is made. A method for monitoring pilots for heavy primary hits on hair and skin structures is described utilizing nuclear emulsions placed in direct contact with the flat portions of the arms. Tracks of heavy primary traversals are plotted; and heavy primary thindown hits on the Stratolab IV and Manhigh II flights are compared and tabulated. The intensity of thindown hits was found to be not only dependent on altitude and geomagnetic latitude of the exposure but, also, markedly dependent on exposure time with the solar sunspot cycle. A seven-fold reduction in thindown intensity is indicated at the top of the atmosphere during periods of maximum sunspot activity; thus this natural amelioration of the cosmic-ray hazard should be considered in planning for manned exploration of the moon and planets. (Author)

PB 154 341 $7.60

Aviation Medical Acceleration Lab., Naval Air Development Center, Johnsville, Pa.
COMPARISON OF TRACKING PERFORMANCE IN THE TV-2 AIRCRAFT AND THE ACL COMPUTER/AMAL HUMAN CENTRIFUGE SIMULATION OF THIS AIRCRAFT, by John L. Brown, Helmut Kuehnel and others. Rept. no. 4 on Task MR005. 15-1003. 1. 7 Nov 60, 71p. 8 refs. NADC-MA-6016/NADC-AC-6008; AD-250 129.

DESCRIPTORS: *Flight simulators, Simulation, Pilots, Tests, Centrifuges, Tracking, Training devices, Jet training planes, Acceleration, Analog computers, Instrumentation.

Any advantage in the use of the centrifuge for the study of pilot tracking performance in a maneuvering aircraft when the maximum linear accelerations are on the order of 5 G was not indicated. Anomalous angular motions of the centrifuge, caused disorientation and nausea of the subject pilots, and probably served to offset any advantage gained by the inclusion of the acceleration forces in the simulation. For the tracking tasks the results of work with a static, or fixed-base, simulator provided as good a basis for prediction of the way in which pilots would perform a specific task in the aircraft as did work performed on the centrifuge.

The primary advantage of a centrifuge simulation probably lies in situations in which linear acceleration forces are sufficiently high to have an appreciable mechanical effect on a pilot, are sustained for relatively long durations, and are introduced primarily as a result of action of longitudinal thrust or longitudinal drag and not by angular motions. The validity of centrifuge simulations of space vehicles cannot be assessed until space missions are flown, but the centrifuge provides the only way in which effects of acceleration encountered in rocket vehicles can be studied in advance of actual missions into space. (Author)

PB 154 776 $6.60

Directorate of Research Analysis, Holloman AFB, N. Mex.
DIRECT VARIATIONAL METHODS AND BRACHISTOCHRONE PROBLEMS, by Joe R. Foote, Terence Butler and others. Jan 61, 62p. 9 refs. AFOSR-101; AD-251 008.

DESCRIPTORS: *Flight paths, Aircraft, Mathematical analysis, Determination, Numerical methods and procedures, Calculus of variations.

A direct method in variational calculus was invented and applied to a variety of examples, especially to aircraft flight path optimization, but without numerical results in that case. Advantages and limitations of both this method and indirect methods are discussed. Further lines of research, both theoretical and numerical, are indicated, and a purely numerical technique is described. (Author)

PB 154 159 $2.60

[Institute of Science and Tech.] U. of Michigan, Ann Arbor.
MODEL OF A TYPE AIR DEFENSE SYSTEM, by K. Appel, M. Goldberg and others. Rept. on Contract DA 36-039-sc-64627. July 59, 29p. 3 refs. Technical memo. no. 2354-13-R.

DESCRIPTORS: *Mathematical computer data, Programming, *Aircraft defense systems, Design, *Operations research.

Following design of an experimentation with a large computer model of an air-defense system, it became apparent that certain aspects of such systems could be investigated with a less complex and expensive model. A general-type model was designed and programmed in the SOAP II language for the IBM 650 computer. This memorandum contains a brief description of the model and its operation, formulas and their derivations flow charts, and input and output formats. (Author)

PB 150 841 $3.60

Mississippi State U. [State College]
BOUNDARY LAYER STUDIES ON THE PHOENIX SAILPLANE, by August Raspet and Dezso Gyorgyfalvy. Rept. presented at the VIII Congress of Organisation Scientifique et Technique Internationale du Vol a Voile, Köln, Germany, on [Contract Nonr-978(01)]. June 60, 1960, 37 p. 9 refs.

DESCRIPTORS: *Gliders, Flight testing, Sandwich construction, *Airfoils, Design, Drag, *Boundary layer, Pressure, Measurement.

The results of this investigation provide evidence that Dr. Eppler's method for calculating airfoils for prescribed design conditions is successful and reliable. No airfoil has ever before been reported which, according to full scale free flight test data at low Reynolds numbers, had such low drag, such a high maximum lift coefficient and such extensive laminar boundary layer flow. This success, however, could have been achieved only by means of the new fiberglas-balsa sandwich construction of the Phoenix which provided ultimately smooth and wave-free surfaces.

PB 150 840 $3.60

Mississippi State U. [State College].
PERFORMANCE ANALYSIS OF THE "HORTEN IV" FLYING WING, by Dezso Gyorgyfalvy. Rept. presented at the VIII Congress of Organisation Scientifique et Technique Internationale du Vol a Voile, Köln, Germany, on [Contract Nonr-978(01)]. June 60, 1960, 38p. 10 refs.

DESCRIPTORS: *Gliders, Tests, Drag, Wings.

The present investigation has basically cleared the conditions by which the performance of the Horten IV was limited. However, a large margin of improvement seems to be possible by means of proper drag reduction. An up-to-date flying wing of the size of the Horten IV should be able to reach a best gliding ratio of nearly 50 to 1. In the case of one of the very best conventional designs, like the Phoenix, such a high performance seems to be feasible only if extensive boundary layer control were applied. This verifies that the flying wing design is not an obsolete idea, but is worthy of further development.

PB 155 922 $8.10

National Research Labs., Ottawa (Canada).
THE FLIGHT MEASUREMENT AND ANALYSIS OF TAIL LOADS DUE TO PILOT AND AIRCRAFT RESPONSE IN SYMMETRIC MANOEUVRES, by E. J. Becze. Jan 61, 84p. 24 refs. Aeronautical rept. LR-296; NRC no. 6264.

DESCRIPTORS: *Flight testing, *Tails, Load distribution, Analysis, Aerodynamics.

Through a programme of flight testing of an interceptor aircraft, various quantities pertinent to the specification of the tail loads which are to be expected in pullups were determined. Theoretical calculation of responses and related quantities were compared with flight measurements for a number of pullups. Results of a simplified method for the calculation of the tail loads were also compared with the measured values. Angular accelerations obtained from various prediction formulas for angular acceleration were compared with the observed values. Plots

are given of the elevator angles and rates, of the angular accelerations, of the normal accelerations and the times to reach peak normal acceleration, and of the incremental positive and negative tail loads. (Author)

PB 154 521 $5.60

Sperry Phoenix Co., Ariz.
THE DEVELOPMENT OF A UNIVERSAL AUTOMATIC FLIGHT CONTROL SYSTEM AN/ASW-12(V). Quarterly progress rept. no. 8, 1 Jan-31 Mar 60, on Contract DA 36-039-sc-75040. 30 Apr 60, 52p. 2 refs. Rept. no. LJ-1260-0001-8.
Order from LC mi$3.60, ph$9.30 PB 154 521

DESCRIPTORS: *Automatic pilots, *Control systems, Flight testing, Aircraft, *Helicopters, Target drones, Stabilization systems, *Stabilization, Command systems.

Results of the RL-23 aircraft and H-21 helicopter flight test programs are presented to demonstrate the ability of the Automatic Flight Control System AN/ASW-12(V) equipped aircraft to satisfy specification requirements. Component environmental test data and H-37 component installation data are included. Smooth engage circuits for the altitude control in fixed wing and helicopter installations are described and illustrated in detail. (Author) (See also PB 152 230)

Civil Engineering

PB 155 093 $3.60

Arctic Aeromedical Lab., Fort Wainwright, Alaska.
AN EVALUATION OF WINTER SURVIVAL SHELTERS USED BY THE U. S. AIR FORCE IN ALASKA, by Frederick A. Milan. Jan 61, 36p. Technical rept. 60-8; AD-252 140.

DESCRIPTORS: *Portable shelters, *Shelters, Survival, Arctic regions, Temperature, Construction, Design, Parachutes, Tests, Glass textiles, Housing.

The thermal environments of six winter survival shelters with wood-burning fires were investigated at Ladd AFB, Alaska, in the winter months of 1954. Ambient temperatures ranged between 0 and -41F. The survival shelters included a one-and six-man lean-to, two types of paratepees, a willow shelter, and a moss covered shelter. A glass cloth fireplace utilized in the tests proved to be a light-weight and portable substitute for a Yukon stove and allowed a fire to be kindled in an enclosed shelter. The willow shelter, paratepees, and moss covered house provided adequate and similar thermal environments. The lean-tos were inadequate and it is recommended that teaching of their construction be discontinued in the Arctic Survival School. It is further recommended that consideration be given by the Arctic Survival School to the construction of moss covered shelters, as moss mats are abundant in the arctic taiga. (Author)

PB 153 964 $7.60

Naval Civil Engineering Lab., Port Hueneme, Calif.
BLAST LOADING OF 15 FT R/C BEAMS, by J. R. Allgood, S. K. Takahashi, and W. A. Shaw. 9 Jan 61, 72p. 14 refs. Technical rept. 086; AD-249 657.

DESCRIPTORS: *Beams, Reinforced concrete, Blast, Load distribution, *Structures, *Vulnerability.

This report presents the results of a series of tests designed to reveal the nature of the dynamic response of restrained R/C beams as compared with simple beams. A secondary aim was to verify the results of previous small-scale beam tests. The test data gives an insight into the complex elasto-plastic action of simple and restrained flexural members. It was found that considerable advantage is to be gained by using restrained instead of simply-supported ones and that the simulator is an exceptionally simple and reliable loading device. (Author)

Electrical and Electronic Engineering

PB 171 806 $4.00

Aeronautical Electronic and Electrical Lab., Naval Air Development Center, Johnsville, Pa.
ENGINEERING INVESTIGATIONS IN THE DEVELOPMENT OF MIL-STD-704 TO REPLACE SPECIFICATION NO. MIL-E-7894. PART II, by O. Markowitz. Final rept. pt. 2, on TED Proj. no. ADC EL-52043. 9 Aug 60, 284p. 31 refs. Rept. no. NADC-EL-6029; AD-249 418.

DESCRIPTORS: *Aircraft, *Electric power production, *Electrical equipment, Electrical networks, Design, Specifications, Military requirements, *Power supplies, Power plants, Direct current.

As the result of study, the following major changes in the specifications were made: (1) removal of test section, (2) removal of voltage-frequency characteristic, (3) widening of steady-state voltage limits, (4) reducing subdivision of characteristics from four to three areas, and (5) reducing the maximum limits for a-c voltage transients. The following reports are appended: (1) Development of definitions for Voltage Modulation Characteristics in 380- to 420- CPS Aircraft Electric Systems, (2) Development of Definitions and Limits for Frequency Transients and Frequency Modulation in Aircraft 380-420-CPS Electric Systems, and (3) Characteristics and Measurement of Ripple in Aircraft D-C Electric Power Systems, (4) Considerations for an Aircraft Electric Power system Design Specification, (5) Areas of Aircraft Electric Power Systems Operation, (6) Development of a Method to Define Limits for Voltage Transients in Aircraft Electric Power System, and (7) Part 1: Test Section for use with Standard No. MIL-STS-704, and Part 2: Derivation of Aircraft Electric Power Source Impedance for Part 1.

PB 154 739 $3.60

Antenna Systems Lab., U. of New Hampshire, Durham.
THE DESIGN AND PERFORMANCE OF PARAMETRIC AMPLIFIER ANTENNAS, by Albert D. Frost and Ronald R. Clark. Scientific rept. no. 3 on Contract AF 19(604)3892. 30 Nov 60, 33p. 6 refs. AFCRL-11; AD-251 578.

DESCRIPTORS: *Antennas, *Amplifiers, *Microwave amplifiers, Satellite vehicle antennas, Dipole antennas, Design.

Details of the internal construction of two forms of parametric amplifier antenna, a quarter-wave dipole operating at 54 Mc. and a half-wave dipole at 108 Mc. are shown, together with external tuning networks for adjustment of the location of the internal coaxial TEM resonances to correspond with the signal frequency and the selected idler frequency. These amplifier-antennas exhibit a stable gain of 10 to 15 db relative to a passive antenna of the same proportions. Control of the DC bias potential required by the voltage-variable capacitors employed as the active parametric elements permits rapid switching at rates in excess of 100 kc. Gain vs. frequency curves are given together with output waveforms for various switching conditions. (Author)

PB 149 950 $6.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
A NEW APPROACH TO THE SYNTHESIS OF OPTIMAL SMOOTHING AND PREDICTION SYSTEMS, by Emanuel Parzen. Technical rept. no. 34 on Contract Nonr-225(21). 15 July 60, 63p. 35 refs. AD-240 426.

DESCRIPTORS: *Mathematical prediction, Statistical analysis, Series, Functional analysis, *Communication systems, *Control systems, Signal-to-noise ratio, Synthesis.

An approach to minimum mean square error linear prediction and smoothing problems which may be called coordinate free are described. Suitable coordinate systems which contain several other approaches (such as eigenfunction expansions and shaping filters) as special cases are introduced. The approach applies simultaneously to time series which are stationary or non-stationary, discrete or continuous parameter. Explicit solutions are given to problems of linear prediction, minimum variance unbiased linear estimation and Bayes estimation of signals, and unbiased linear prediction. To express the solutions in terms of concrete operations on data, one must evaluate inner products in a suitable reproducing kernel Hilbert space. Several ways of doing this are given, including an iterative procedure which makes possible the approximate synthesis of an optimum linear communication or control system in the presence of noise whose covariance function can be of any form and can be known either analytically or numerically. Decision theoretic extensions are also indicated. (Author)

PB 154 203 $4.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
CRITERIA FOR RADAR PULSE CABLES, by John P. Agrios. 1 June 60, 44p. 11 refs. USASRDL Technical rept. 2117; AD-242 204.

DESCRIPTORS: *Pulse cables, Radar equipment, Radiofrequency cables, Design, Transmission lines, Coaxial cables.

Pulse cables have been designed and fabricated which are capable of operating at voltages up to 25 kv peak; transmit rms currents up to 230 amperes; maintain reasonable pulse fidelity of the pulse shape for lengths in the neighborhood of 300 feet; do not allow leakage of electromagnetic energy which may interfere with nearby sensitive communication equipments; and are flexible over the ambient temperature range of -55°C to +55°C. The constructional features and the performance characteristics of the cables are discussed. to include attenuation, voltage, current and power handling capabilities. (Author)

PB 154 351 $5.60

Army Electronic Proving Ground, Fort Huachuca, Ariz.
ECONOMIC BASIS FOR FREQUENCY ALLOCATION, by William Hlusko, Jr. (U. of Arizona). Technical memo. Aug 60, 51p.

DESCRIPTORS: *Radiofrequency power, *Radio equipment, *Antennas, Economics, *Radio communication systems, Radio transmitters, Theory, Costs, Logistics, *Radiofrequency.

This report deals primarily with the economic basis for frequency allocation. A series of frequencies and varying distances were used for the study. For a given amount of radiated power for each of the frequencies used, the antenna size and transmitter power were determined and converted to capital costs. The economic factors of frequency, and transmitter and antenna size were not possible to evaluate by the nomograph form. These factors depend upon the type of equipment needed, upon the siting of the antenna, and the problem of logistics. In planning coverage over certain paths, four items of equipment were considered; transmitter, transmission line, antenna and the antenna support.

PB 149 439 $3.60

Battelle Memorial Inst., Columbus, Ohio.
ESTIMATION OF THE PARAMETERS OF A GENERAL CLASS OF FAILURE PROCESSES WITH PARTICULAR REFERENCE TO THE WEIBULL PROCESS, by Arthur E. Mace. Technical rept. no. 1 on Evaluation of the Use of Certain Statistical Techniques in Reliability Analysis, Contract Nonr-2864(00). July 60, 31p. 19 refs. AD-240 340.

DESCRIPTORS: *Statistical data, Experimental data, *Statistical processes, Statistical tests, Transistors, Germanium, Life expectancy, *Electronic equipment.

A methodology is developed for the estimation of the parameters of a general class of failure processes from experimental data. The class of failure processes consists of those in which the dependence relation between time and the conditional density function of failure probability is such that known functions of each of the two variables exist which are linearly related to each other. Maximum likelihood estimates of the parameters of a linear transform of this dependence relation can be obtained numerically using central differences to approximate differentials. One process is the Weibull failure process which is obtained when a single-component structural device under prescribed loading conditions is subject to a power-law breakdown mechanism. Methods are applied to censored data from a prematurely terminated life test of a germanium surface barrier transistor. The predominant failure mechanism is presumed to be thermally induced deterioration, with heterogeneity among nominally identical specimens in their response to thermal stress producing a distribution of failure times. (Author)

PB 155 067 $8.60

Collins Radio Co., Cedar Rapids, Iowa.
DESIGN AND DEVELOPMENT OF FILTER, BAND PASS F-366()/UR, by Robert E. Canfield. Technical rept. on Contract AF 30(602)1832. 11 Apr 59, 93p. 2 refs. Rept. no. CER 965; RADC-TR-59-96; AD-217 676.

DESCRIPTORS: *Band-pass filters, Design, *Ultra high frequency filters, Ultra high frequency, Radio communication systems, Radio interference.

The design and development of the F-366()/UR Filter, Band Pass are described. The design of this filter enables operation of a 1.5 kilowatt UHF transmitter in combination with other transmitters and receivers in narrow frequency spacing and one location with reduced mutual interference. (Author)

PB 156 091 $7.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
THEORETICAL COMPARISON OF BINARY DATA TRANSMISSION SYSTEMS, by Harold D. Becker and John G. Lawton. Final rept. on Contract AF 30(602)1720. May 58, rev. Mar 61, 78p. 125 refs. Rept. no. CA-1172-S-1; RADC-TR-58-91; AD-148 803.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Data transmission systems, Analysis, Errors, Signal-to-noise ratio, Frequency shift keyers, Phase shifters, Theory.

Ground-Air data communication links are analyzed and compared on the basis of the error probability attained as a function of the received signal-to-noise ratio. For the case of frequency-shift keyed (FSK) modulation it is shown that the lowest error rate can be obtained by using a detector which incorporates two matched filters and a synchronized sampling and decision circuit. FSK systems are compared with phase-shift keyed (PSK) systems and it is shown that the coherent PSK system is theoretically the optimum binary data transmission system. Analysis of the differentially coherent PSK system, which does not require a separate phase reference for detection, shows this system to approach the performance of the coherent PSK system. The study is concluded with an analysis of modulation methods directed at minimum bandwidth PSK systems. Recommendations for future investigation are outlined and a supporting bibliography for the study is presented. (Author)

PB 154 742 $10.10

Cruft Lab., Harvard U., Cambridge, Mass.
THE TRAVELING-WAVE LINEAR ANTENNA, by Edward E. Altschuler. Scientific rept. no. 7, series 2, on Contract AF 19(604)4118. 5 May 60, 124p. 21 refs. AFCRL-TN-989; AD-245 662.

DESCRIPTORS: *Antennas, Impedance, *Dipole antennas, Theory, Electromagnetic properties, Measurement.

It is shown experimentally that an essentially traveling-wave distribution of current can be produced on a linear antenna by inserting a resistance of suitable magnitude one quarter wavelength from the end of the antenna. A theory for the resistively-loaded antenna is formulated on the basis that the inserted resistors (one in each arm) can be replaced by equivalent generators and that the resulting triply-driven antenna can be solved by the superposition of singly and doubly-driven dipoles. With a traveling-wave distribution of current on an antenna available, the properties of this antenna are then investigated and compared with those of the conventional linear antenna. It is found that the input impedance of the traveling-wave antenna remains essentially constant as a function of antenna length, whereas that of the conventional linear antenna varies considerably. It is also shown that the input impedance of the traveling-wave antenna is reasonably constant over a two to one frequency band. The directional properties of the traveling wave and conventional dipole are compared and it is shown that a minor lobe does not appear in the radiation pattern of the traveling-wave dipole until it is much longer than the conventional dipole. (Author)

PB 156 093 $7.60

Curtiss-Wright Corp., Carlstadt, N. J.
PROGRAMMING TECHNIQUES FOR COMMUNICATION AND NAVIGATION FACILITIES, by H. B. Barling, J. R. Durant and others. Rept. on Simulation Research, Contract AF 33(600)37510. Oct 59, 73p. 6 refs. WADC Technical rept. 59-792; AD-231 260.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Programming, *Communication systems, *Navigation computers, Analog to digital converters, *Magnetic recording systems, Digital computers.

The design of a digital-automatic receiver programming system is described. This system places data for 90 radio navigation stations on a magnetic drum and

permits simulated radio navigation receivers to operate on this data based on frequency selection and range of the station. Audio station signals are recorded and made available from magnetic tapes. The design of the Engineering model of the digital-manual station programmer, which was attached to the ME-1 Trainer, is described. (Author)

PB 155 617 $2.60

Diamond Ordnance Fuze Labs., Washington, D. C.
COMPLEMENTARY FILTERING, by R. N. Johnson and G. R. Hickox. 1 Mar 61, 25p. 15 refs. Technical rept. TR-865; AD-252 485.

DESCRIPTORS: Electronic circuits, *Telemetering, Low pass filters, High pass filters, Frequency modulation, Telemetering transmitters, *Radiofrequency filters.

A method was developed for providing a low-distortion dc to 160-kc telemetry link. An FM/FM subcarrier is used for the d-c and low-frequency portions and direct FM for the high frequencies. Basically, a waveform of such frequency range is divided into two overlapping bands that are recombined with a minimum design error through use of complementary filtering and appropriate phase equalization. Theoretical and mathematical investigations indicate that spectrum splitting and recombination without waveform distortion may be effected with a low-pass Butterworth filter and its high-pass counterpart provided (1) the filters are of odd order, and (2) phase equalization is correctly accomplished. (Author)

PB 154 941 $5.60

Eagle-Picher [Research Labs.] Joplin, Mo.
AUTOMATICALLY ACTIVATED ZINC-SILVER OXIDE BATTERY. Final rept. on Contract DA 36-039-sc-72343. 15 Mar 57, 55p. AD-137 955.

DESCRIPTORS: *Guided missile batteries, Design, *Alkaline cells, Materials, Zinc, Silver compounds, Oxides.

Early test models developed on this project were designed with the use of vacuum activating forces. This was later modified to eliminate the vacuum and use pressure activation in conjunction with a metallic electrolyte reservoir and gas-producing squibs. Test results on this final battery indicate that it will meet all the test requirements of Technical Requirements No. 56-ELS/D-3832. (Author)

PB 154 945 $3.60

Eastman Kodak Co., Rochester, N. Y.
DEVELOPMENT OF A PULSED HOMING BEACON, by H. Pitts, R. Marsh, and R. W. Graham. Final rept. 25 June 56-14 Feb 58, on Contract DA 36-039-sc-73067. [1958] 37p. 4 refs. AD-159 751.

DESCRIPTORS: *Guided missiles, Recovery, *Electronic equipment, *Radio beacons, Design, *Very high frequency, Radio signals.

The general mechanical and electrical characteristics are given for a VHF radio beacon capable of transmitting a coded, double pulse signal. The homing beacon consists of a transmitter, transmitter power supply, and beacon light battery supply, all enclosed in a water-tight, kidney-shaped package. Discussions are given on the component assemblies, the general development work conducted, the design problems encountered, and the general operating characteristics. An analysis of collected data indicated that the beacon complies with design requirements. A voltage converter operating from an LV source is recommended for inclusion in the beacon for improved over-all reliability.

PB 150 385 $2.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
THE PRESENT THEORY OF SWITCHING AND SOME OF ITS FUTURE TRENDS, by A. A. Mullin. Technical rept. no. 3 on Contract Nonr-1834(21). 8 July 60, 30p. 76 refs. AD-242 251.

DESCRIPTORS: *Switching circuits, Theory, *Information theory, Mathematical logic, Bibliography, Algebra, *Communications theory.

Contents:
Classical theory
  Classical combinational switching circuits
  Classical sequential switching circuits
Stochastic theory
  Relay stochastic combinational switching
  Relay stochastic sequential switching

PB 155 161 $9.60

Electronic Defense Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
BIBLIOGRAPHY ON FERROELECTRICS, by Robert Hall. Rept. on Contract DA 36-039-sc-75012. 9 Jan 59, 118p. 1, 268 refs. Technical memo. no. EDL-M165; AD-210 781.

DESCRIPTORS: *Ferroelectric materials, Bibliography.

The references have been analyzed according to fifty categories which are of interest because they are connected with possible microwave applications, are needed for an understanding of the material, or for an understanding of materials preparation and related matters. Under each category are listed the numbers of the pertinent references.

PB 155 162 $2.60

Electronic Defense Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
THE USE OF NON-LINEAR DIELECTRIC MATERIALS AT MICROWAVE FREQUENCIES, by Robert S. Pepper. Rept. on Contract DA 36-039-sc-73170. 16 Oct 58, 23p. 2 refs. Technical memo. no. EDL-M122; AD-208 307.

DESCRIPTORS: *Dielectrics, Refractive index, *Microwave frequency, Mathematical analysis, *Ferroelectric materials, *Ceramic materials, Materials.

The materials used were ferroelectric ceramics (Glenco K6000 and Aerovox-High Q 40) of unknown composition. Encouraging results were obtained with an experimental double stub tuner which uses ferroelectrics as the tuning elements. Methods were studied and experimentally verified for utilizing the change in capacity (with applied voltage) that occurs in ferroelectric ceramics. Recommendations for further study are included along with suggestions for using ferroelectric material in microwave components.

PB 150 513 $5.60

Electronics Research Lab., U. of California, Berkeley.
ACTIVE RC SYNTHESIS WITH PRESCRIBED SENSITIVITIES, by L. P. Huelsman. Rept. on Contract Nonr-222(74). 22 July 60, 52p. 13 refs. Rept. no. 107; IER series 60, issue no. 296; AD-242 548.

DESCRIPTORS: *Negative resistance circuits, *Resistors, *Capacitors, Synthesis, Functions, Electrical networks, Sensitivity, Circuits.

The basic theory of negative-impedance converter RC synthesis is considered from a mathematical viewpoint by determining the conditions under which an arbitrary polynomial representing the numerator or denominator of a given transfer function can be equated to the difference of 2 polynomials. Root-locus techniques are used to determine the most advantageous choice of these polynomials from the standpoint of sensitivity to changes in the gain of the negative-impedance converter. A method of synthesis is presented which permits control over the sensitivities of both the numerator and the denominator of the given transfer function and also guarantees realization of the component RC networks. The use of a pair of negative-impedance converters is investigated. If the gains of these vary in a similar manner, the component networks may be chosen such that even higher-order transfer functions can be realized with low sensitivities. The limiting case of zero sensitivity for a transfer function of any degree of complexity can be achieved by the use of a pair of negative-impedance converters whose variations in gain are identical. (Author)

PB 150 512 $4.60

Electronics Research Lab., U. of California, Berkeley.
ARBITRARY DELAY EQUALIZATION UTILIZING DIGITAL COMPUTER, IBM 704, by Li-Hsiang Shang Cheo. Rept. on Contract Nonr-222(74). 5 July 60, 46p. 2 refs. Rept. no. 106; IER series 60, issue no. 294; AD-242 549.

DESCRIPTORS: *Electrical networks, *Delay circuits, Mathematical analysis, *Digital computers, Least squares method, Synthesis, *Transmission lines.

This project is related to network synthesis, beginning with a given specification of the behavior of the network as a function of frequency. From this given specification, a network function is found, then the physical network can be realized. The task of obtaining the network function from the given specification is termed an approximation. A method is used to solve any delay problem by applying the least square technique, in which the IBM 704 is utilized to serve the iteration purpose. (Author)

PB 152 400 $4.60

Electronics Research Lab., U. of California, Berkeley.
CORRELATION PROCESSES IN ANTENNA ARRAYS, by I. W. Linder. Rept. on Contract Nonr-222(74), 26 July 60, 48p. 8 refs. Rept. no. 111; IER series no. 60, issue no. 301; AD-244 061.

DESCRIPTORS: *Antennas, Design, Correlation techniques, Mathematical analysis, Antenna radiation patterns, *Radio signals, Sources.

Consideration of antenna arrays designed to receive randomly varying signals buried in a noisy medium is facilitated by the use of statistical correlation techniques. With the familiar linear additive array, the correlation coefficients of signal and of spatially distributed noise can be used to obtain the element spacing for optimum signal reception. With nonlinear arrays the output voltage again is expressed in terms of the correlation coefficients of the signal and noise voltages induced on the elements. The directivity patterns obtained for the nonlinear arrays were shown to be equivalent to those of linear arrays of greater length. These patterns, and an analysis of the averaging time required to perform the correlation process, show that the correlation technique in antennas is an exchange of length for time. When more than one signal source is present, the correlation array encounters difficulties from the cross-product terms occurring in the multiplication processes. With two coherent sources, resolution may only be possible at specific separations, rather than over a general range of separations. In this case, each array must be examined under the actual signal source conditions to determine exact behavior. With independent sources, the process of correlation reduces the cross-product effect, and the principle of length-time exchange is again valid. (Author)

PB 152 234 $5.60

Electronics Research Lab., U. of California, Berkeley.
A FERRITE FIELD DISPLACEMENT DEVICE FOR SLOT COUPLING CONTROL, by D. E. Norton and D. J. Angelakos. Rept. on Contract Nonr-222(74). 25 July 60, 52p. 5 refs. Rept. no. 108; IER series no. 60, issue no. 297; AD-243 725.

DESCRIPTORS: *Waveguides, *Waveguide slots, *Waveguide couplers, Magnetic fields, Standing wave ratios, Phase shifters, Design, Measurement, Ferrites.

A ferrite iris is placed in a waveguide in the vicinity of a slot cut through the broad wall of the guide. A variable dc magnetic field is used to bias the iris causing a displacement of the waveguide mode, thus affording control of radiation through the slot. A large range of coupling may be obtained. Coupling from 5 db to 60 db below incident power is obtained with one iris. Other characteristics such as phase variation, VSWR, and electric field distribution are also investigated. Two methods of biasing are investigated, in one of which the magnetic field is applied to both sides of the iris while in the other it is applied to only one side. It is found that the iris reacts somewhat differently for the two types of biasing. (Author)

PB 155 390 $1.60

Electronics Research Lab., U. of California, Berkeley.
PONTRIAGIN'S MAXIMUM PRINCIPLE AND THE PRINCIPLE OF OPTIMALITY, by Charles A. Desoer. Scientific rept. no. 3 on Contract AF 19(604)5466. 11 Nov 60, 12p. 9 refs. IER Series no. 60, issue no. 326; AFCRL-TN-60-1171; AD-253 240.

DESCRIPTORS: *Electronic circuits, Control systems, Servo systems, Calculus of variations, Differential equations.

An attempt was made to derive the maximum principle of Pontriagin in a completely different fashion. The point of view adopted here is to use the principle of optimality. As shown recently by S. E. Dreyfus, (Jnl. of Math. Anal. and Appl. 1: 228-239, 1960) this point of view is particularly powerful to obtain the necessary conditions satisfied by the solutions of variational problems. The derivation is particularly simple and, in particular, does not require OMEGA to be convex. In fact the derivation will make it obvious that the validity of the maximum principle does not depend on the terminal conditions imposed on the optimal trajectory, that is, the maximum principle is valid if the optimal trajectory must reach a fixed point in state space, a moving point in state space (with a specified law of motion), or a moving subset of the state space. (Author)

PB 150 791 $2.60

Electronics Research Lab., U. of California, Berkeley.
QUARTERLY PROGRESS REPORT, 1 APRIL-30 JUNE 1960. Rept. on Contracts Nonr-222(74, 53, 54, 57). 31 July 60, 26p. 1 refs. Series no. 60 [issue] no. 29; AD-243 155.

DESCRIPTORS: Scattering, Conical bodies, *Semiconductors, *Electromagnetic waves, Magnetic amplifiers, Information theory, *Electronic circuits, Ferrites, High temperature research, Theory, Antennas.

Contents:
Back-scattering from cones
Scattering from multiple targets
Scattered fields from anisotropic media
Radiation from a modulated ferrite traveling-wave antenna
Ferrite field-displacement device for slot-coupling control
Network theory
Electronic circuits research
Antenna arrays from a data-processing viewpoint
Information theory
Solar radiation
Research in high-temperature semiconductor devices
Magnetic amplifiers
(See also PB 148 098)

PB 152 235 $3.60

Electronics Research Lab., U. of California, Berkeley.
RADIATION FROM A MODULATED FERRITE TRAVELING-WAVE ANTENNA, by R. N. Fenton and D. J. Angelakos. Rept. on Contract Nonr-222(74). 26 July 60, 31p. 8 refs. Rept. no. 109; IER series no. 60, issue no. 299; AD-243 726.

DESCRIPTORS: *Antennas, *Electronic scanners, Ferrites, Antenna radiation patterns, Analysis, Waveguides, Electromagnetic waves, Dielectrics.

A ferrite surface wave structure was investigated as a possible electronically scannable antenna. The effective permeability of the ferrite, and hence the wave velocity, could be controlled with an applied dc magnetic field. A method of finding the radiated field pattern from the velocity distribution along the surface is given. The first ferrite structure investigated consisted of a ferrite slab on a ground plane. Its radiation pattern was not appreciably affected by the dc magnetic field. To resolve the difficulty, a trough waveguide system was built. This arrangement indicated that the ferrite losses caused excessive attenuation. The lowest loss structure found, a thin ferrite on top of a dielectric slab, still had losses which would impair the operation of the antenna. Because of this large attenuation, experimentation with periodic modulation was not continued. (Author)

PB 155 167 $4.60

Franklin Inst. Labs. for Research and Development, Philadelphia, Pa.
INVESTIGATION OF LOW LEVEL RF VOLTAGE AND POWER MEASUREMENT TECHNIQUES, by Max M. Hirsch and Donald L. Birx. Final engineering rept. for 1 July 56-6 June 58 on Contract DA 36-039-sc-72827. 8 Sep 58, 47p. 77 refs. Rept. no. F-A1957; AD-201 828.

DESCRIPTORS: *Radiofrequency power, *Voltage, Measurement, *Signal generators, *Bolometers, Test equipment, Design, Detection, Sensitivity, Superconductivity, Radiofrequency.

Capabilities of rf detection and measuring devices are reviewed with special emphasis on theoretical limitations of bolometers. Two systems are recommended as showing promise of approaching the measurement goals of the contract. The first is a bolometer bridge employing a number of specialized techniques for realizing the full capabilities of the bolometer used. Secondly, the use of superconducting bolometers is advocated as a means of achieving high sensitivity with very low noise. Tentative performance figures for both of these systems are included. (Author)

PB 154 891 $4.60

General Electric Co., Schenectady, N. Y.
APPLICATION OF TUNNELING TO ACTIVE DIODES, by R. N. Hall. Scientific rept. no. 3A on Contract AF 19(604)6623. 23 Dec 60, 41p. 25 refs. AFCRL-28(A); AD-251 652.

DESCRIPTORS: *Semiconductors, Germanium, Physical properties, Arsenic, Antimony, Mathematical analysis, Tests, Temperature, Silicon, *Diodes, Crystals, Growth, Zinc, Gallium alloys, Resistance, Cadmium, Mercury, Magnesium, Deformation, Indium, Gallium, Antimony alloys, Arsenides.

Measurements have been made on the effect of a uniaxial stress on the tunneling current in germanium p-n junctions. Data has been obtained for both arsenic doped and antimony doped material. The experiments are designed to test the predictions of a tentative theoretical model, and the agreement is very encouraging. Further experiments are described to test this model. Distribution coefficients of several column 2, 4, and 6 elements in GaSb are reported, and unusual physical properties are discussed briefly. Experimentally determined mobilities are compared for heavily doped germanium, silicon, and III-V compound semiconductors. Curves of room-temperature resistivity are given for each material. The growth of GaAs crystals from non-stoichiometric melts doped with Mg, Zn, Cd, and Hg has been studied. Distribution coefficients of these impurities are found to be larger in As-rich than in Ga-rich systems. Crystals grown from undoped Ga-rich solutions are n-type. (Author)

PB 154 892 $3.60

General Electric Co., Syracuse, N. Y.
APPLICATIONS OF TUNNELING TO ACTIVE DIODES by N. Holonyak, Jr. Scientific rept. no. 3b on Contract AF 19(604)6623. Dec 60, 32p. 8 refs. AFCRL-28(B); AD-251 750.

DESCRIPTORS: *Diodes, Penetration, Gallium compounds, Arsenides, Indium compounds, Phosphides, Intermetallic compounds, *Semiconductors, Reliability Failure (Mechanics), Growth, Crystals, Electron tubes, Germanium, Tin, Alloys.

Materials and tunneling studies in GaAs and Ga (AsP) are described. GaAs has been grown epitaxially both on GaAs and on germanium seeds by means of halogen transport processes. Low-current-density tunneling has been obtained in epitaxially grown GaAs p-n junctions. Degenerate and lightly doped Ga(AsP) crystals have been synthesized by means of halogen reaction and transport processes, and tunnel diodes (with negative resistance) have been fabricated on some of the degenerate Ga(AsP) crystals. GaAs has been doped with tin at about 850 C and exhibits a donor concentration of 3.5 x 10 to the 18th power/cc. A detailed description of the GaAs failure-reliability problem and the manner in which it manifests itself is presented. (Author)
(See also PB 154 891)

PB 153 968 $8.10

General Telephone and Electronics Labs., Inc., Bayside, N. Y.
STUDIES OF ELECTRON TUBE MATERIALS AND THERMIONIC EMISSION PROCESSES, by L. R. Bloom, B. Bartels and others. Scientific rept. no. 2, 1 July-30 Sep 60, on Contract AF 19(604)7286. 31 Oct 60, 87p. 6 refs. TR 60-704-104-204-205-208.4; AFCRL-TN-60-1144; AD-249 638.

DESCRIPTORS: *Electron tubes, *Materials, Thermionic emission, Metallurgical analysis, Nickel, Tungsten, Aluminum compounds, Processing, Diodes, Test methods, *Lenses, *Microscopy, *Microscopes.

Contents:
Studies of the properties of ultrapure nickel
Metallurgical phase report
Chemical phase report
Thermionic phase report
Tungsten-alumina reaction study
Re-activation of mass spectrometer and circuitry
Resolution measurements
Machine adjustments for improving resolution
Photographic measurement of ion beam
First installation of Knudsen cell
Emission microscopy
Optimization of lenses
Analyses of image formation
Interpretation of emission patterns
(See also PB 153 431)

PB 155 168 $9.60

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
SECOND HARMONIC MAGNETIC MODULATORS, by Robert Wilbur Harley. Master's thesis. Rept. on Contract AF 04(645)9. 25 Aug 58, 111p. 36 refs. Rept. T-192; AD-207 007.

DESCRIPTORS: *Magnetic modulators, Mathematical analysis, Saturable reactors, Reactor cores, Ferromagnetism, Theory.

A mathematical representation is derived for a nonlinear magnetic reactor having a core with low eddy current loss and abrupt saturation, switched cyclically between positive and negative saturation by an intense magnetic field, relative to the coercive force. The foundation for the derivation is the theory of domain nucleation and Bloch wall dynamics which is

commonly accepted. Simplifications of the general relationships are those appropriate to an analysis of second harmonic magnetic modulators used in dc or operational amplifiers. The constants used to characterize the core are those obtained from constant-current switching measurements rather than conventional hysteresis loops, magnetization curves, or permeability measurements. Second harmonic magnetic modulators are analyzed using this representation. The results indicate the significance of excitation magnitude and frequency in determining the system function, the linear range, and the output phase relative to the excitation. Terminal impedances, dynamic response and power gain are derived. The significance of core matching is investigated and found to depend on the circuit external to the modulator. (Author)

PB 153 961 $3.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE RADAR MEASUREMENT OF RANGE, VELOCITY AND ACCELERATION, by Edward J. Kelly. Rept. on Contract AF 19(604)7400. 6 Jan 61, 35p. 2 refs. 47G-0013; AD-249 468.

DESCRIPTORS: *Radar ranges, *Velocity, *Acceleration, Measurement, Frequency modulation, Amplitude modulation, Errors, *Radar.

The general theory of radar measurement is applied to the measurement of acceleration together with range and velocity. Of course, it is actually range, Doppler-frequency and Doppler-rate which are measurable in a monostatic radar, and the familar ambiguity function for range and Doppler measurement is extended to an ambiguity function for all three quantities. The moment matrix for the measurement errors in these three quantities is computed for the strong-signal (small-error) case, and the effects of various types of amplitude- and frequency-modulation are discussed. An interesting feature is the dependence of the velocity error on the true acceleration and an unavoidable, acceleration-dependent correlation between the range and velocity errors. (Author)

PB 154 940 $2.60

Maxson, W. L., Corp., New York.
TRANSISTOR CONVERTER POWER SUPPLY FOR THE AN/PRC-6 RADIO SET. LEAST UNIT COST IN PRODUCTION, by Alfred I. Paley. Objective rept. 12 Apr 57-11 July 58, on Contract DA 36-039-sc-73246. [1958] 23p. 1 ref. AD-205 337.

DESCRIPTORS: *Power supplies, *Costs, Production, Design, *Transistors, *Radio, *Radio communication systems, Communication systems.

Report of the features of the design of the Transistor Converter Power Supply for Radio Set AN/PRC-6 which have reflected the Least Unit Cost in Production effort. Included are results of a study made to determine oscillator operating frequency best suited to keep cost low and maintain operating efficiency and satisfactory performances. (Author)

PB 154 192 $3.60

Melabs, Palo Alto, Calif.
INVESTIGATION OF MICROWAVE NON-LINEAR EFFECTS UTILIZING FERROMAGNETIC MATERIALS, by Roy W. Roberts. Quarterly progress rept. no. 13, 1 May-31 July 60, on Contract DA 36-039-sc-73278. [1960] 40p. 9 refs. AD-244 593.

DESCRIPTORS: *Frequency multipliers, Analysis, Ferrites, Electromagnetic properties, Microwave amplifiers, Single crystals, Design, *Ferromagnetic materials.

The effect of both crystalline and geometric anisotropy on second harmonic conversion efficiency is pointed out. An experiment to measure the effect of crystalline anisotropy is outlined. A theory for the longitudinally-pumped ferrite amplifier is developed in terms of normal ferrite modes. This theory is applicable to all types of operation - magnetostatic, semistatic, and electromagnetic. A K-band ferrite amplifier is described. This amplifier used a 0.149 inch YIG sphere, pumped at 35 kmc. Amplification and oscillation were achieved at various frequencies between 14.6 - 17 kmc. The amplification frequency lay within the magnetostatic mode spectrum while the idler frequency was outside it. (Author) (See also PB 147 994)

PB 155 072 $5.60

Melpar, Inc., Falls Church, Va.
COTAR SYSTEM CIRCULARLY POLARIZED ANTENNA. Final engineering rept. 28 May 58-28 Jan 59, on Contract AF 08(606)2686. 28 Mar 59, 51p: 8 refs. AFMTC-TR-59-6; AD-214 626.

DESCRIPTORS: *Very high frequency, *Antennas, *Direction finding, Design, Polarization, Antenna radiation patterns, Guided missile tracking systems.

The development and fabrication are presented of a VHF circularly-polarized Cotar system antenna. Antennas of this type could be used in place of the vertically-polarized monopole antennas presently used with the Cotar system to provide reception to any linear polarization to aid in missile tracking. Major characteristics required in the antennas are nearly hemispherical radiation coverage, circular polarization over the region of coverage, and location of the antenna phase center to within $\pm .005$ inches. A circularly-polarized discone was developed which yielded near hemispherical radiation coverage and a good degree of circular polarization over this radiation region. Due to the size of the antenna and available fabrication techniques, the phase center could not be located to the desired tolerance; however, it was located to within $\pm .050$ in., or approximately $\pm .001 \lambda$. Of particular interest are the phase measuring technique and the accuracies to which these measurements could be made even at VHF. (Author)

PB 154 939 $8.10

Michigan U. Research Inst., Ann Arbor.
ALTERNATIVE DETECTION OF MODULATIONS IN CO-CHANNEL FREQUENCY MODULATION, by Hansford W. Farris. Technical rept. no. 84 on Contract DA 36-039-sc-63203. June 58, 86p. 30 refs. 2262-179-T; AD-212 370.

DESCRIPTORS: *Frequency modulation, Radio communication systems, Interference, Radio signals, Detection, Amplitude modulation.

The problem treated in this investigation is that of rendering the weaker of two co-channel frequency modulated signals readable in spite of the well-known capture effect which ordinarily suppresses the weaker signal. As most of the previous work in the FM interference area has been concerned with enhancing the effect of the strong signal in its suppression action, and because the results of this effort are utilized in the present study, the published studies are reviewed in detail. The technique involved takes advantage of two situations, namely, the natural tendency of a strong FM signal not to be influenced on the average by the presence of a weaker signal and the recent development of suitable methods of strong-signal enhancement. With the strong signal available free of the amplitude and frequency interference effects due to the co-channel presence of the weak one, the receiver considered here performs the operation of subtracting the strong signal from the linear combination of strong and weak signals, leaving the weak signal to be detected in the usual manner.

PB 154 942 $9.60

Microwave Associates, Inc., Boston, Mass.
CIRCULAR WAVEGUIDE COMPONENTS, by A. A. Blaisdell and P. D. Rutledge. Final rept. 1 Jan 55-1 Feb 58, on Contract DA 36-039-sc-63230. [1958] 115p. AD-204 230.

DESCRIPTORS: Transmission lines, *Waveguides, Waveguide filters, Waveguide joints, Waveguide couplers, Waveguide slots, Waveguide bends, Transformers, Standing wave indicators, Design.

This contract is concerned with investigations leading to circular waveguide transmission systems capable of supporting at least the next higher TE_{ON} mode (TE_{02}) and the development of techniques to prevent its excitation and/or TE_{02} filtering sections. A substantial amount of effort was directed toward increasing the power handling capabilities of existing transition designs. Results were encouraging and power capacities corresponding to equivalent rectangular waveguides were realized. Oversize circular waveguide components including transformers, directional couplers, TE_{02} mode filters, standing wave detectors, and associated connectors and hardware were investigated, designed, and fabricated. The results indicated that the feasibility of oversize circular waveguide transmission systems is not impractical, and is very much desirable with certain modifications of existing components. This report contains detailed information relative to the theoretical and developmental phases of the contract. Complete outline drawings for all components developed and modified are contained herein.

PB 155 065 $1.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ELECTRONIC MATERIALS RESEARCH, by Herbert J. Carlin. Technical note on Contract AF 30(602)1816. 15 Jan 59, 17p. 4 refs. Rept. R-710-58; PIB-638; RADC-TN-59-148; AD-214 500.

DESCRIPTORS: *Microwave equipment, Materials, *Ferromagnetic materials, *Films, Single crystals, *Nuclear magnetic resources, Indium, Semiconductors.

Contents:
Hall effect properties of ferromagnetic films
Electromagnetic polarizing effects in thin ferromagnetic samples
Report on indium antimonide films
Single crystal preparation
Nuclear magnetic resonance studies

PB 154 202 $2.60

Microwave Associates, Inc., Burlington, Mass.
REFINEMENT PROGRAM ON ELECTRON TUBE S BAND TR EST-27, by Robert Gunshor. Quarterly progress rept. no. 1, p. May-31 July 60 on Contract DA 36-039-sc-85316. [1960] 22p. 2 refs. AD-245 477.

DESCRIPTORS: *Electron tubes, S-band, *Microwave equipment, Silicates, Yttrium compounds, Iron compounds, Tests, *Transmit-receive tubes, Design, Quality control, Manufacturing methods, Ferrites, Waveguides, Waveguide irises.

A prototype EST-27 was received from the Signal Corps, and low level testing was begun to evaluate the performance. Changes were made in cavity coupling to optimize insertion loss and bandwidth. It was concluded that the selectivity curve indicated by the bandwidth specifications is not feasible with a single, iris coupled, reentrant cavity. Efforts will be directed to optimize bandwidth with emphasis on the 10 db level. The performance of the encapsulated window at low level will be improved. Initial efforts in the second phase of the project have been directed towards developing techniques for utilizing YIG; a new, low loss, ferrimagnetic material. Electronic tuning would be accomplished by varying the current in a small electromagnet coil; the main dc field set up by a permanent magnet. (Author)

PB 154 944 $3.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
STUDY OF MICROWAVE FERRITE DUPLEXER, by L. M. Silber and M. A. Treuhaft. Final rept. on Contract DA 36-039-72327. 19 June 58, 36p. 8 refs. Rept. R-668-58; PIB-596; AD-204 156.

DESCRIPTORS: *Microwave equipment, *Ferrites, *Radar duplexers, Design, Phase shifters, *Broadband, Frequency, Microwave networks.

Investigations were made into microwave duplexers using ferrites to obtain non-reciprocal properties.

Various microwave network schemes were investigated in an effort to attain high isolation over a band of frequencies. A multiple circulator network which increased the bandwidth by stagger tuning achieved a reasonable measure of success. The emphasis on the broadbanding problem led to the suggestion of the use of active elements in matching networks. Several theoretical analyses were made on this topic, but no resort to experiment was made. Also, toward the same objective of broadbanding, a class of circulator called "coupled wave circulators" was extensively investigated. This effort was only moderately successful in broadbanding the isolating properties of the duplexer. The use of ferrite toroids in non-reciprocal phase shifters and in circulators was introduced. This application was immediately rather strikingly successful and it offered many advantages. One of the advantages was the complete elimination of the heavy and rather awkard external magnet structure. Another spectacular advantage was the rapidity and ease with which the magnetic and microwave properties could be switched using these ferrite toroids.

PB 154 343 $5.60

New York U. Coll. of Engineering, N. Y.
AN OPTIMIZATION PROCEDURE FOR A SINGLE-LINK UNIDIRECTIONAL DIGITAL COMMUNICATION SYSTEM IN THE PRESENCE OF ADDITIVE GAUSSIAN NOISE AND FOR DETECTION INDEPENDENT OF FADING, by Ludwik Kurz. Scientific rept. no. 3 on Contract AF 19(604)6168. 15 Sep 60, 51p. 15 refs. AFCRL-TN-60-1101; AD-250 210.

DESCRIPTORS: *Digital systems, *Data transmission systems, Errors, Communication theory, Noise, *Communication systems.

The basic problem of transmitting digital information through a noisy channel with minimum probability of error in finite time is considered. The transmitted signals are average-power limited, and the noise is assumed to be additive gaussian with a power spectrum which may be non-white. Detection independent of fading is assumed. A theory of so-called efficient codes (minimax, equal separation, and nearly equal separation) is developed. The theory of equidistant and nearly equidistant codes is extended to the case of non-white gaussian noise. Efficient codes perform better than equidistant codes if the noise is non-white. Performance results are given for different codes for white gaussian noise and guassian noise with power spectrum curves that increase slowly and rapidly with frequency. (Author)

PB 155 113 $2.60

Queensland U., Brisbane (Australia).
A HIGHLY DIRECTIVE ROTATING ARRAY FOR THE OBSERVATION OF FIELD-ALIGNED IRREGULARITIES, by J. A. Thomas and R. W. E. McNicol. Scientific rept. no. 1 on Contract AF 64(500)9. Sep 60, 25p. 2 refs. AFCRL-TN-60-1119; AD-252 605.

DESCRIPTORS: *Antennas, Design, Australia, Rotating structures, *Transmission lines, Antenna masts, Antenna radiation patterns, *Radio waves, Reflection, Scattering, Transmitter receivers, Electronic switches, Mathematical analysis.

The need for a highly directive rotating array is briefly discussed and the factors determining the overall array design are brought forward. Within the limits imposed by economy, various types of array are analysed, the choice finally residing in 4 Yagi aerials at a spacing of 1.1 wavelengths. Suitable methods have been devised for feeding each Yagi with the appropriate current determined according to a Dolph-Tchebyscheff analysis. Using a T-R switch, the effective total beam width at 16 mc is 8 degrees. Aerial test patterns, and records of echoes from field-aligned ionisation are given. (Author)

PB 154 482 $2.60

Radio Corp. of America, Somerville, N. J.
108 mc, 10-watt SILICON TRANSISTORS, by S. Daskam. Quarterly rept. no. 4, 1 Mar-1 June 60, on Contract DA 36 039-sc-78325. [1960] 27p.

DESCRIPTORS: Diffusion, Measurement, *Transistors, *Silicon, *Semiconductors, Electrical properties, *Radiofrequency amplifiers, Oscillator circuits, Radiofrequency

The major engineering effort was directed toward refining and improving the diffusion techniques by using starting material of 20-40 ohm-cm resistivity, and material of 1-2 ohm-cm resistivity. A method was developed to more accurately measure the depth of diffusion of the emitter and of the base. Further work was done to improve the metalizing process. Two techniques, aluminum evaporation and a subsequent etching process, and silver plating, were both evaluated for reproducibility and improvement of device parameters. The area of bonding, both with RCA developed equipment, and with commercially available apparatus, was investigated in an effort to improve the production rate for devices. Several units were tested in the 108 Mc oscillator circuit shown in the report and some parameters were measured and are presented. (Author)

PB 154 905 $9.60

RCA Defense Electronic Products, Camden, N. J.
CANCELLATION AND INTEGRATION EQUIPMENT. Final rept. on Contract AF 19(604)2438. 31 Oct 60, 116p. AFCRL-9; AD-251 687.

DESCRIPTORS: *Integrators, *Radar pulses, *Video signals, *Radar signals, *Delay lines, *Video delay lines, *Video integration, Magnetic recording systems, *Radar scanning, Data storage systems, Signal-to-noise ratio, Radar equipment, *Radar receivers, Circuits, *Electronic circuits, Test methods, Design, Moving target indicators.

The cancellation and integration equipment was constructed and evaluated in the laboratory. The theoretical signal to noise improvement afforded by the integrator is 11 db while the measured improvement is 10 db. The cancellation ratio of the system is limited by the system noise to 30 db. The design and operation of this equipment is described. Recommendations are given for improvements in future systems. Included are operating instructions and recommended maintenance procedures. (Author)

PB 155 040 $7.60

RCA Defense Electronic Products, Camden, N. J.
DESIGN AND STUDY OF CORRELATION INSTRUMENTATION FOR SPEECH ANALYSIS AND SYNTHESIS, by J. P. McEvoy, A. D. Stromback and others. Scientific rept. no. 1 on Contract AF 19(604)6151. 15 Oct 60, 75p. 24 refs. AFCRC-TN-60-1147; AD-252 997.

DESCRIPTORS: *Speech transmission, Design, *Voice communication systems, Integrators, *Speech representation, Coding, Speech, Camera tubes, Analysis, Synthesis, Storage, Video signals, Film readers, Analog systems, Correlation techniques, Timing circuits, Signal to noise ratio, Signals.

An evaluation is presented of three principle methods for implementing the operations required in a speech redundancy system. The results of a study are given which evaluated the film/vidicon analog serial processing system. The principal advantage of this system lies in its compact size and inherently high reliability. The system functions as follows. The vocoder analyzer outputs are serially scanned and compared against the output of the vidicon memory. After comparing the vocoder output with all patterns in the store, the pattern which best matches the vocoder analyzer output is noted and a digital number associated with the pattern is transmitted. At the receiver, the digital number received supplies the necessary gating which selects the vidicon pattern store output at the moment the correct pattern is read-out of the vidicon. This locally generated pattern is then presented to the vocoder synthesizer. In transceiver equipment, one film/vidicon memory could supply patterns for both transmit and receive functions simultaneously. A description is presented of the complete vidicon analog signal processing system. (Author)

PB 155 037 $4.60

Research and Advanced Development Div., Avco Corp., Wilmington, Mass.
RECEPTION OF WWV AND WWVH IN NORTHERN CANADA, by John R. Herman and Rudolf B. Penndorf. Scientific rept. no. 8 on Research Concerning Forecasting Anomalous Propagation at High Latitudes, Contract AF 19(604)4092. Jan 61, 48p. 19 refs. Technical rept. RAD-TR-61-5; AFCRL-15; AD-252 121.

DESCRIPTORS: Radio broadcasting, Canada, *Radio stations, *Radio transmission, Aurorae, *Radio reception, High frequency, *Ionospheric propagation, Solar atmosphere, Ionosphere, Radio waves, Absorption, Ionization, Propagation.

Quiet-day diurnal, seasonal, and latitude variations in reception quality of WWV and WWVH transmissions on six frequencies from 2.5 to 25.0 mc at five northern Canadian stations between 45 degrees and 75 degrees N latitude are given. Solar, propagation-mode, and auroral effects on these transmissions are considered. The investigation shows that the orientation of transmission path with respect to auroral zone affects reception quality on long paths (WWVH), and reception improves going northward. It appears that a tilt mode of propagation on long path is possible at times when sunrise occurs simultaneously near the two end points of the path. On magnetically quiet days, WWV (15.0 mc) reception has been possible for all hours of the day regardless of season during sunpot maximum of 1957-1958. (Author)

PB 154 359 $2.60

Rome Air Development Center, Griffiss AFB, N. Y.
A FREQUENCY DIVISION MULTIPLEXER OF ADVANCED DESIGN FOR AIR FORCE APPLICATIONS, by Donald B. Nowakoski and Richard C. Benoit, Jr. Nov 60, 21p. RADC TN-60-226; AD-250 551.

DESCRIPTORS: *Multiplex transmission, Design *Air force communications, *Frequency dividers, Frequency multipliers, *Radio communication systems, *Communication systems, Transistors, Voice communication systems.

An analysis of the military versus commercial requirements for multiplex equipment indicates that for a worldwide, high-capacity military communication system, more stringent technical and physical criteria must be met and existing equipments are not entirely suitable for a global military communications configuration. Based on the results of this analysis, the development of a multiplexer to meet the specific needs of the USAF was initiated. The Multiplexer Set, AN/FCC-17, which is being developed by the United States Air Force for use in tactical and fixed-plant applications, is a single sideband, frequency division multiplex facility completely transistorized and expandable from a basic 12 (4 kc) channel group to a full complement of 600 (4 kc) channels. (Author)

SCTM-81-61(24) $0.75

Sandia Corp., Albuquerque, N. Mex.
IMPROVING TRANSISTOR SWITCHING AT ELEVATED TEMPERATURES WITHOUT THE USE OF REVERSE BIAS, by N. J. Elliott and A. L. Johnson. Apr 61, 17p.

PB 152 665 $8.60

Seattle Development Lab., Minneapolis-Honeywell Regulator Co., Wash.
PHOTOELECTRIC SENSING TELETYPE DISTRIBUTOR-TRANSMITTER, by Orlien N. Becker, William G. Doke and Matania Ginosar. Final rept. 1 July 56-25 Aug 58, on Contract DA 36-039-sc-72820. [1958] 96p; AD-209-923.

DESCRIPTORS: *Teletype systems, *Radio transmitters, Tests, Design, *Photoelectric cells, Switching circuits, Transistors, Distributors

Two models of Distributor-Transmitter TT-191()/FG were developed and tested. Three different technical approaches were evaluated, two utilizing continuous tape drive with disc scanning of the code positions, and the third employing a magnetic stepping motor with electronic distribution. The latter was chosen for final design of the two models. Model TT-191 (XC-1/FG operates at speeds of 368.1, 404, 460, 600, and 1500 operations per minute, using the 7.42 Baudot Code. The XC-2 model operates at speeds of 600 and 4500 operations per minute, using the 7.50 Baudot Code. This model also provides output connections for parallel character readout. Both models work into a neutral 130-volt, 20- or 60-milliampere line. (Author)

PB 149 533 $8.10

Stanford Electronics Labs., Stanford U., Calif. ELECTRON DEVICES RESEARCH. Consolidated quarterly status rept. no. 13, 1 Jan-31 Mar 60, on Contracts DA 36-039-sc-73178, AF 33(616)6207, AF 19(604)5480, Nonr-225(40), and Nonr-225(24). [1960] 84p. 29 refs. AD-240 195.

DESCRIPTORS: *Electronic equipment, *Electron tubes, *Plasma physics, Electron beams, Backward wave amplifiers, *Microwave amplifiers, Frequency converters, Ferrites, Traveling wave tubes, *Superregeneration, *Backward wave oscillators, Phonons, Radiofrequency filters, Amplifiers, Oscillators, Magnetostrictive resonators, Noise (Radio).

Contents:
Depressed collector; Current flow in plasmas; High-voltage wide-band traveling wave amplifiers; Stationary non-equilibrium plasmas; Backward-wave amplifier; Power limitations in wide-band traveling-wave tubes; Broadband maser amplifiers; Theoretical studies of solid state masers; General microwave device studies; Transverse-wave electron-beam tubes; Parametric amplifiers; Solid-state masers; Microwave phonons in solids; General traveling-wave and backward-wave oscillator studies; Miscellaneous microwave-device studies; Electrolytic-tank studies; Parametric circuits for frequency conversion, amplification, and mixing; Solid-state traveling-wave parametric amplifier; Electron beam parametric amplifier; Superregeneration in parametric amplifiers; Broadband parametric amplifiers; Noise studies; Hollow-beam electrostatic focusing; Plasma backward-wave parametric amplifier; Construction techniques for electron devices; Ferrimagnetic filters and resonators; Study of high-power hollow-beam traveling-wave amplifiers. (See also PB 148 332)

PB 150 655 $7.60

Stanford Electronics Labs., Stanford U., Calif. ELECTRON DEVICES RESEARCH. Consolidated quarterly status rept. no. 14, 1 Apr-30 June 60, on Contracts DA 36-039-sc-73178, AF 33(616)6207, AF 19(604)5480, Nonr-225(40), Nonr-225(24). 1960, 80p. 52 refs. AD-242 743.

DESCRIPTORS: *Electronic equipment, *Electron tubes, Traveling wave tubes, Backward wave amplifiers, Backward wave oscillators, Microwave amplifiers, *Plasma physics, *Superregeneration, Phonons, Microwave equipment, Electron beams, Noise (Radio), Magnetostrictive resonators, Radiofrequency filters, Ferromagnetic materials.

Contents:
Depressed collector; Current flow in plasmas; High-voltage wide-band traveling-wave amplifiers; Stationary non-equilibrium plasmas; Backward-wave amplitubes; Harmonic pumping in maser materials; Broadband maser amplifiers; Theoretical studies of solid state masers; General microwave device studies; Investigation of noise in electron guns; Transverse-wave electron-beam tubes; Parametric amplifiers; Solid-state masers; Microwave phonons in solids; General traveling-wave and backward-wave oscillator studies; Superregeneration in parametric amplifiers; Miscellaneous microwave-device studies; Electrolytic-tank studies; Electron beam parametric amplifier; Noise studies; Hollow-beam electrostatic focusing; Plasma backward-wave parametric amplifier; Construction techniques for electron devices; Ferrimagnetic filters and resonators; Study of high-power hollow-beam traveling-wave amplifiers. (See also PB 149 533)

PB 149 814 $10.50

Stanford Electronic Labs., Stanford U., Calif. LOGICAL SCHEDULING OF A MULTIPLEXED DIGITAL CONTROLLER, by E. W. Henry. Rept. on Contract Nonr-225(38). 11 July 60, 139p. 18 refs. Technical rept. no. 2106-1; AD-241 163.

DESCRIPTORS: *Control systems, *Digital computers, Data, Sampling, *Programming.

Problems which arise when several dynamic processes are controlled simultaneously by a single digital computer are considered. Methods of synthesizing a digital controller program for a cyclic-sampled system are derived. One design yields a system which exhibits an error transient of finite duration in response to polynomial inputs. Another procedure yields a controller which minimizes a weighted quadratic function of the system error states and the process input energy The latter design is extended to include control of multi-input processes. The digital controllers for these cyclic-sampled systems are described by linear difference equations with periodically time-varying coefficients. Both state-feedback and error-sampled systems are discussed. The scheduling of a multiplexed controller which maintains conventional constant period sampling for each process is discussed. Elementary concepts of number theory and combinatorial analysis are used to find all possible sets of sampling periods. Design considerations for an error-adaptive multiplexed digital controller are also discussed. Each process may operate in either a "normal" or a "disturbed" condition. The computer is programmed to change the various sampling periods as a function of these process conditions so that the over all system performance is improved. Techniques are given for minimizing transient effects which may arise when a process sampling rate is changed. (Author)

PB 155 169 $2.60

Varian Associated, Palo Alto, Calif.
VA-88 TEST AND EVALUATION PROGRAM, by E. Murphy. Final rept. on Contract AF 30(602)1874. Jan 59, 23p. Engineering rept. no. 232-1; RADC-TR-59-30; AD-211 436.

DESCRIPTORS: *Radial beam tubes, Design, *Klystrons, *Switching circuits, Tests, Electron beams, Focusing.

Efforts were made to determine the practicability of switching high power electron beams in the presence of high dc voltage. A secondary purpose was to apply this switching device to a standard klystron, the VA-87. The first purpose was realized. It is practicable to operate such a tube up to near 100 kilovolts and probably more. The second purpose was not realized, but it almost certainly can be accomplished with some redesign of either the gun or the anode. Some loss of perveance may result from this redesign.

PB 147 114 $1.60

Watkins-Johnson Co. [Palo Alto, Calif.]
FEASIBILITY STUDY OF A 10 MEGAWATT KLYSTRON FOR LONG PULSE OPERATION, by O. T. Purl. Technical rept. no. 1, Nov 59-Mar 60, on Contract Nonr-3020(00). [1960] 14p. File no. W-J 60-372R1; AD-236 250.

DESCRIPTORS: *Klystrons, *Microwave amplifiers, Design, Electron beams, Focusing, Cathodes (Electron tubes), Heating, Modulation, Electron guns.

The objective of this study is to determine the feasibility of developing a klystron amplifier with output power of 10 megawatt peak and 100 kw average and capable of operation at pulse length of 2 milliseconds minimum and longer if possible. The tube may be tuned to any fixed frequency very close to 3000 mc/sec. Several tubes have been built that satisfy the peak power requirement. These tubes have been operated at short pulse lengths of 7 to 10 μsec with an average power output of 5 to 15 kw. As the pulse length is increased, several problems arise. First, if an oxide cathode is used, as is the usual case, the cathode loading may be high enough to cause slumping of the circuit towards the end of the pulse. Ion bombardment of the cathode may also lead to failure. In addition, arcing in the gun region may occur if the spacings are not adequate. More severe problems however, appear to be associated with peak heating of the surface of the drift tube or cavity ferrules and with transmitting 100 kw of average power through a single window. Also the modulation of the tube becomes more costly in weight and size of the condenser bank and power supply. It is the purpose of this interim report to discuss these problems and their possible solutions. (Author)

PB 155 066 $23.50

Westinghouse Electric Corp., Baltimore, Md.
FIFTY FOOT PARABALLOONS FOR USE AT 200 MC AND L-BAND FREQUENCIES. Final engineering rept. on Contract AF 30(602)1420. 30 June 59, 462p. 18 refs RADC-TR-59-127; AD-225 538.

DESCRIPTORS: *Radar antennas, Design, Materials, *Pneumatic devices, *Radomes, Radar equipment. Antennas, Balloons, Pneumatic systems.

Highly mobile, tactical, high-gain, air-supported antennas and pedestal assemblies were developed for Radar Sets AN/MPS-11 and AN/MPS-11A, Radio Set AN/TPS-1D, and Radar equipment SK-1M, utilizing the Paraballoon antenna technique. The antenna system comprised the following major component areas: (1) An air-supported radome, its inflation equipment, and its anchorage equipment. (2) The air-supported Paraballoon antenna reflector and its inflation system. (3) The rotating mount for the Paraballoon antenna. (4) The antenna feed system. (5) Control and power equipment. The specification requirements for the radome were that it protect the enclosed Paraballoon antenna and other equipment from wind and weather, surviving winds up to 80 knots velocity, and that it be suitable for tactical applications. (Author)

PB 154 831 $1.60

Westinghouse Research Labs., Pittsburgh, Pa.
CROSS-DOPING AGENTS FOR RUTILE MASERS, by P. F. Chester. Rept. for 6th quarter on Contract AF 19(604)5589. Sep 60, 15p. 11 refs. Research rept. 403FD449-R6; AFCRL-TN-1174; AD-251 291.

DESCRIPTORS: *Microwave amplifiers, Oxides, *Titanium compounds, *Tantalum, *Niobium, *Cerium, Nuclear spins, Lattices, Crystals, Paramagnetic resonance, Hyperfine structure, Chromium.

Tantalum and niobium appear to be suitable cross-doping agents for securing a short spin-lattice relaxation time in masers using rutile as the host crystal. Initial tests on rutile doped with chromium and tantalum are encouraging. Cerium does not appear to enter rutile as Ce(3+). Departure from stoichiometry, although it results in a spectrum with short spin-lattice relaxation time, presents the problem of non-frequency-selective cross-relaxation. (Author)

Ordnance, Missiles, and Satellite Vehicles

PB 154 227 $6.60

Air Force Missile Development Center, Holloman AFB, N. Mex.
HOLLOMAN TRACK CAPABILITIES, by R. C. Rethmel and Wm. H Chambers, Jr. Nov 60, 69p. AFMDC-TR-60-24, supersedes AFMDC-TR-59-14, AD-212 717; AD-250 057.

DESCRIPTORS: *Rocket propelled sleds, *Electronic equipment, Test vehicles, *Tracks (Aerodynamics), *Test facilities, Instrumentation, *Photographic equipment, Guided missiles.

The AFMDC track facilities consist of the following: (1) a dual-rail sled that can carry a 200 pound payload to 3,900 feet/second at 56 g maximum acceleration, (2) a monorail sled that can carry a 150 pound payload to over 4,000 feet/second, and (3) various liquid-fueled sleds which, with a long thrust duration, can achieve relatively high velocities with a large payload and low accelerations. The instrumentation support capability

is as follows: (1) operational FM/FM, PCM, and PDM telemetry systems in the 800 mc region, (2) miniaturized, rugged, dependable sled-borne tape recorders, (3) a velocity-measuring system with an error of less than one part in 20,000, (4) the most advanced timing and programming system in existence, and (5) sufficient numbers and types of data collection cameras to furnish practically any optical coverage required. (Author) (See also PB 142 375)

PB 161535(Rev. 2) $0.75

Director of Defense Research and Engineering, Washington, D. C.
TECHNICAL RESOURCES DIRECTORY: MISSILE GROUND SUPPORT EQUIPMENT NO. 4. 1 May 61, 25p.

DESCRIPTORS: *Guided missiles, *Military equipment, Directories.

Through its extensive research and engineering programs, the Department of Defense is developing material and equipment designed to meet present and future military requirements. The diverse tasks embraced in these programs range throughout the broad scope of military activities. This directory of military technical resources is intended to encourage communication in the Military Departments and in industry in the area of ground support equipment for missile systems. (Supersedes issue no. 3, 1 Nov 60, PB 161 535(Rev. 1)

PB 154 777 $1.60

Directorate of Research Analysis, Holloman AFB, N. Mex.
THE INFLUENCE OF AIR DENSITY ON THE CHARACTERISTIC PARAMETERS OF THE OSCULATING ELLIPSE OF A SATELLITE ORBIT, by Richard H. Anderson. Feb 61, 20p. 4 refs. AFOSR-103; AD-251 310.

DESCRIPTIORS: *Orbital flight paths, Drag, *Satellite vehicle trajectories, Density, Perturbation theory, Air.

The general equations describing the perturbations of an orbit due to air drag were derived. The methods used in their derivation differ from those usually applied to orbit perturbation problems, and it is evident that these methods are applicable to a wide range of trajectory problems. For many practical problems it is necessary to have an estimate of the decrease in the altitude of a satellite whose orbit is nearly circular. For this purpose a very simple equation was developed which quickly gives a good estimate of the variation of the altitude of a satellite after one rotation. (Author)

PB 149 841 $1.60

Electronic Systems Lab., Mass: Inst. of Tech., Cambridge.
A STUDY OF THE FEASIBILITY OF AN OPTICAL-FLASH ACOUSTIC-PING TRANSPONDER SYSTEM FOR SHORT RANGE UNDERWATER TRACKING, by Donald F. Clements. Rept. on Contract Nonr-1841(53). July 60, 12p. 8 refs. Rept. 8060-R-3; AD-240 885.

DESCRIPTORS: *Optical tracking, *Light transmission, *Sonar, *Torpedoes, Range, Sea water, Luminescence, Flash lamps, Attenuation, Phototubes, Tracking.

The use of optical tracking as a possibility for torpedo tracking instrumentation is considered. The system described is that of an active torpedo closing on a submarine. Conclusions reached from the calculations of effective ranges for underwater flashes are as follows: (1) the maximum theoretical range at which a flash of reasonable size may be detected in clear oceanic waters is about 600 to 800 feet at night, (2) optical noise sources in the water further limit the range to about 300 feet due to marine organism bioluminescence both day and night, and (3) at submerged depths of 100 feet, sub-surface light when the sun is directly over head may limit range to under 100 feet due to reflections of various sorts. Specific areas discussed are light source intensity, light attenuation in water, optical noise sources, phototube self noise, sub-surface sunlight, and bioluminescence.

PB 154 147 $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
FINITE DIFFERENCE ANALYSIS OF THE SHOCK RESPONSE OF A PACKAGED MISSILE WITH NON-LINEAR SUSPENSION MOUNTS, by T. R. Beal. Technical memo. on Flight Sciences. Sep 60, 30p. 1 ref. LMSD-703088; AD-243 856.

DESCRIPTORS: Guided missiles, Digital computers, Difference equations, Vibration isolators, Vibration, Mathematical analysis, Dynamics, *Impact shock, *Packaging, Containers, Numerical analysis.

A method is described for obtaining solutions of vibrating systems with more than one degree of freedom which may readily be adapted to solution on a digital computer. If such a computer is not available, or if the size of the problem does not warrant its use, a desk calculator may be used, as was done in the case of the numerical examples given. A discussion of the errors inherent in the finite difference analysis was purposely omitted. In most cases the accumulation of such errors after a large number of steps is of primary concern. For the case described, however, the main concern would ordinarily be the response of the system during the first few cycles; this represents a relatively small number of steps, for which the accumulated error would not be significant. (Author)

PB 154 146 $5.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
HIGH-SPECTRUM REACTORS AS POSSIBLE THERMIONIC PRIMARY HEAT SOURCES, by John E. Cobb. Technical memo. on Physics. Sep 60, 51p. 51 refs. LMSD 703084; AD-244 680.

DESCRIPTORS: *Spaceships, *Electric propulsion, *Ion rockets, Ion sources, *Fast reactors, Thermal utilization, *Thermal diffusion, Neutron spectrum, Transport properties, *Heat transfer, Reactor fuels, Materials, *Diffusion theory.

A one-space dimensional, multigroup, multiregion analysis is performed on a series of fast and semifast neutron spectrum refractory reactor types. Diffusion theory is used with transport corrections applied in the description of the neutron transport process. The boundary conditions and selection of the energy groups used in this analysis give a very good approximation to criticality for the types of reactors studied. Three primary reactor types are investigated pending final heat transfer studies to determine the type which can best supply primary power to the thermionic units at the best mass ratio. The three types studied are: (1) Bare critical, (2) Reflected, and (3) Internally moderated and externally reflected. (Author)

PB 154 300 $8.10

RCA Service Co., Patrick AFB, Fla.
COTAR EVALUATION, by John Beck and Harry W. Trigg. Final rept. on Missile Test Proj., Subcontract to Pan American World Airways, Inc., Contract AF 08(606)3413. 1 July 60, 81p. 14 refs. AFMTC TR-60-18; AD-249 677.

DESCRIPTORS: *Radar tracking, *Guided missile tracking systems, Guided missiles, Range, Tests, Reliability, Radar ranges, Phase measurement.

Inability of the originally installed COTAR on Eleuthera to resolve cosine ambiguities was resolved by replacing the common 500- by 500-ft chicken-wire ground plane with individual 5-ft-radius circular plates. The inability of the Ascension COTAR to resolve ambiguities was caused by multipath from the nearby hills. The effect of multipath was somewhat related to the bearing of the multipath source relative to the direction of a baseline. Multipath effect could be partially controlled by proper baseline orientation. COTAR cosine data were compared with ballistic camera data in aircraft tests at Eleuthera. Since the data was collected within a small volume of space, the confidence factor was low. The average bias was 370 ppm in the L cosine and 164 ppm in the M cosine. These data were analyzed for sigma by the variate difference methods, using 10 pps COTAR data. Sigma was generally below 10 ppm. This value agreed with that obtained from ballistic missile tests. A cyclic error having a 0.01 cosine period was found with an amplitude in L of about 50 ppm and 10 ppm in M. The error was attributed to servo gear-train wear. Attempts to track ballistic missiles with the Ascension COTAR were successful. It was concluded that the COTAR is capable of providing an accuracy of between 50 and 100 ppm if a satisfactory zero set calibration method is made available.

SCTM-67-61-13 $0.50

Sandia Corp., Albuquerque, N. Mex.
SOLUTION TO AN EXPLOSIVE SWITCH PRODUCTION PROBLEM THROUGH THE USE OF QUALITY CONTROL, by J. R. Craig, T. C. Preston, and R. A. Wilson. Apr 61, 13p.

PB 154 229 $7.60

Stanford Research Inst., Menlo Park, Calif.
THE REDUCTION OF ROCKET SLED SLIPPER WEAR WITH SPECIAL EMPHASIS ON SOLID LUBRICATION, by T. D. Witherly. Rept. on Contract AF 29(600)2112. Nov 60, 77p. 13 refs. SRI Project SU-2919; AFMDC-TR-60-35; AD-249 828.

DESCRIPTORS: *Rocket propelled sleds, Lubricants, *Tracks (Aerodynamics), Coatings, Solids, Pressure, Friction, Ablation, Reduction, Materials, Metallurgy, Molybdenum alloys, Tests, Test equipment, Test methods, Sliding contacts.

Methods were investigated for reducing rocket sled slipper wear. Effort was directed toward development of a ductile molybdenum alloy. The wear behavior of several presently available materials was also investigated. Wear data were obtained for several bearing materials on three solid coatings (lime, molybdenum disulfide, and zinc) and on bare steel at nominal bearing pressures ranging from 300 to 1500 psi. Track testing was conducted on the 35,000-foot test track using instrumented test shoes. Test intervals ranged from 2000 to 4000 feet, and velocities were sustained between 2000 and 2500 ft/sec. Wear and friction laboratory tests were conducted at 500 ft/sec, retracking on rotating disks. Track tests demonstrated that slider wear can be reduced to about one-fifth the rate on bare steel by any one of the three track coatings tested, and that the effectiveness of the zinc coating did not diminish until it had been in use for about 1-1/2 years. The development of a suitable molybdenum alloy was not successful. Of high performance ductile materials presently available, vanadium is considered the most attractive with a wear rate about one-third that of steel. (Author)

PB 171 357 $0.50

Watervliet Arsenal, N. Y
RESIDUAL STRESSES IN CIRCULAR TUBES HAVING A HISTORY OF PRESSURE-INDUCED PLASTIC DEFORMATION, by R. E. Weigle and M J. Pascual. Dec 60, 12p. 2 refs. Technical rept. WVT-RR-6014-R; AD-253 528.

DESCRIPTORS: *Stresses, Determination, Mathematical analysis, *Plasticity, *Elasticity, Pressure, *Deformation, *Cylindrical bodies, Military research, *Ordnance steel, *Artillery, *Gun barrels.

The residual stresses are determined for a thick-wall, open-end tube which has been plastically deformed due to the application of an internal pressure and then unloaded. The unloading process is considered to be elastic. The Mises yield criterion is assumed and the stresses in the plastic region are determined accordingly. Lame's solution for thick-walled cylinders is used in calculating the stresses in the elastic region. All quantities are transformed into dimensionless form so that the results can be applied to any tube size. Graphical results are given for a wall ratio of 2.0 and various degrees of plasticity. (Author)

Ship Building

PB 154 133 $2.60

David Taylor Model Basin, Washington, D. C.
THE FAIRING OF SHIP LINES ON A HIGH-SPEED COMPUTER, by Feodor Theilheimer and William Starkweather. Jan 61, 23p. 5 refs. Rept. 1474; AD-249 706.

DESCRIPTORS: *Ships, Design, *Ship hulls, *Programming, Digital computers, Mathematical analysis, Configuration.

Methods for using a digital high-speed computer to determine ship lines are presented. It is assumed that the offsets of a small number of points were taken from a preliminary design, and that it is desired to compute the offsets of an arbitrarily large number of points on the ship's surface. Procedures for using a computer for the solution of this problem are described. Special emphasis is placed on the detection, by a computational criterion, of unwanted fluctuations and the correction of such fluctuations if they should occur. The method also includes a special procedure which takes care that those portions which are straight in the preliminary design remain straight in the final form. Illustrative examples of the methods are discussed. (Author)

PB 154 270 $3.60

David Taylor Model Basin, Washington, D. C.
A RADIO CONTROL SYSTEM FOR A 1/150-SCALE MODEL OF USS FORRESTAL (CVA59), by C. W. Hoffman. Dec 60, 35p. Rept. 1460; AD-249 908.

DESCRIPTORS: *Aircraft carriers, Ship models, Remote control systems, Control systems, *Radio equipment, Design, Maintenance, Operation, Automatic, Instruction manuals, Propulsion, *Storage batteries.

A radio control system designed specifically for use in a 1/150-scale model of the USS FORRESTAL (CVA 59) is described. The system provides individual control of 2 propulsion channels each capable of 5 speeds forward and 5 speeds reverse, and control of the rudders in 5-degree increments over a total range of 70 degrees. All equipment is transistorized except for several tubes in the high-frequency portions of the radio link. Power for the model equipment is supplied by rechargeable storage batteries. System design, operation, and maintenance are described. Schematic diagrams and photographs are included. (Author)

PB 149 882 $3.60

Woods Hole Oceanographic Institution, Mass.
AN EXPERIMENTAL STUDY OF SHIP MOTIONS, by Wilbur Marks. Final rept. on Fundamental Hydromechanics Research Program, Contract Nonr-1168(00). July 60, 40p. 11 refs. Reference no. 60-30; AD-240 847.

DESCRIPTORS: *Ships, *Motion, Theory, *Water waves, Mathematical analysis.

A linear theory of ship motion prediction was presented by St. Denis and Pierson in 1953 [Soc. Naval Architects Marine Engrs., Trans. 61:280-357, 1953]. This report describes an attempt at experimental verification of the theory, for pitch and heave, in head and following seas. Also considered are the improvements due to inclusion of certain coupling terms in the equations of motion as presented by Korvin-Kroukovsky [Ibid., Trans. 63:386-435, 1955]. The pitch and heave of the Woods Hole Oceanographic Institution launch RISK (36 feet long) were recorded for a specific set of test conditions and analyzed in terms of the energy spectra of these motions. Also, from the physical and geometrical properties of the vessel, the particular amplitude response operators in these degrees of freedom were computed with and without the assumption of coupling and finally the corresponding two sets of motion spectra were computed. The observed spectra were compared to the two computed sets of spectra. It was found that: (1) the linear prediction scheme given in (1) agrees reasonably well with observation, (2) the improved response operators (2) yield motion spectra which in general agree more nearly with observation. The improvement due to inclusion of the coupling terms is demonstrated in graphs of comparison. (Author)

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

Engines and Propulsion Systems

PB 147 901 $6.60

Hiller Aircraft Corp., Palo Alto, Calif.
INVESTIGATION OF THE PROCESS OF ENERGY TRANSFER FROM AN INTERMITTENT JET TO AN AMBIENT FLUID, by R. M. Lockwood. Summary rept. for 1 Dec 58-30 June 59 on Contract Nonr-2761(00). 30 June 59, 65p. 29 refs. Rept. no. ARD-238; AD-233 349.

DESCRIPTORS: *Thrust augmentor nozzles, Pulsejet engines, Test equipment, *Exhaust gas ejectors, Configuration, Thrust, Measurement, Schlieren photography, *Exhaust gases, *Fluid flow, Energy, *Jet mixing flow.

Test equipment was developed that permits the simultaneous visualization of the flow patterns and measurement of thrust augmenter performance. Techniques and equipment were developed which enabled visualization of jet efflux with still and motion high speed schlieren photography. The test rig permits attachment of piston in-tube devices to induce a back-and-forth flow at the exit of a tailpipe to mechanically simulate the fluid motion at the tailpipe of a pulsejet. The method of approach was to concentrate first on the kind of device with which study first revealed a degree of thrust augmentation that was much superior to that which could be obtained with steady flow ejector-type thrust augmenters. This device is a valved pulsejet. The source of the intermittent jet is the cycle of resonant combustion which provides strong jet blowdown during

combustion, followed by over-expansion and then a decided reversal of flow back into the tailpipe. There is considerable indication already that this reversal of flow is of utmost importance in the operation of the intermittent jet thrust augmenter. (Author)

PB 155 194 $1.10

Sundstrand Turbo [Div., Sundstrand Machine Tool Co., Rockford, Ill.]
OVERALL CHEMICAL CONVERSION TIME FOR A MODEL FUEL SPRAY, by S. S. Penner and L. L. Bixson. Technical note no. 9 on Contract AF 18(603)107. Dec 60, 8p. 7 refs. S/TD no. 1876; AFOSR-156; AD-252 707.

DESCRIPTORS: *Fuel sprays, *Combustion, Drops, *Liquid rocket propellants, Equations, Stability, Rocket motors, Fuel injection, Fluid flow, Mathematical analysis, Effectiveness.

An investigation was made to relate the chemical conversion time (tau sub c) to the sensitive time lag (tau sub s) in liquid rockets, in order to provide a valid empirical method for evaluating combustion efficiency and high-frequency scaling rules. A complete solution to the problem requires an analytical expression which relates tau sub c to the parameters of injection and combustion. Equations are given which are based on a simplified one-dimensional model of spray burning.

Manufacturing Equipment and Processes

PB 151 109 $1.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
A REVIEW OF BENDING METHODS FOR STAINLESS STEEL TUBING, by C. T. Olofson. Rept. on Contract AF 33(616)7747. 2 Mar 61, 56p. 8 refs. DMIC rept. 150; AD-253 237.

DESCRIPTORS: *Steel tubing, *Stainless steel, Processing, Deflection, *Manufacturing methods, Aircraft Machine tools, Dies, Pipe bends, Hydraulic presses, Machines, Machine shop practice, *Duct bends, Pneumatic systems, Hydraulic conduits.

The report describes the applications and limitations of ram bending, roll bending, rotary compression bending, and rotary draw bending. The last method is the most widely used in the aircraft industry. Large-diameter, thin-wall tubing may be bent without buckling to a 2D minimum bend radius using draw bending and conventional but modified bending tools. Complex and 180-degree bends can be fabricated in one piece. An integrated group of bending, pressure, wiper, and clamp dies, a multiball mandrel, and a clamp plug are used for forming the single bends. Special tooling is needed for compound and multiple bends. Individual tools are made to precise dimensions and with smooth surface finishes. Tool-work-machine setups must be given proper alignments and adequate support pressures so that no mismatch, wrinkling, or other damage can occur to the tube during bending. Proper lubricants must be applied generously at strategic areas to avoid galling and scoring. Once bending is started it must proceed to completion without stopping. (Author)

PB 171 540 $1.00

Diamond Ordnance Fuze Labs., Washington, D. C.
COOLING LARGE ELECTRONIC PACKAGES, by John G. Moorhead. Jan 61, 39p. 3 refs. Technical rept. TR-882; AD-251 342.

DESCRIPTORS: *Cooling, *Packaging, Design, Containers, *Electronic equipment, Heat transfer, Thermoelectricity, Subminiature electronic equipment.

In an investigation of methods of cooling densely packed electronics packages, three cooling systems are compared. It is shown that: (a) a system employing thermoelectric cooling elements which extend from the package walls to the interior is useless except for very small packages; (b) that the package structure can cool packages of considerable size by thermal conduction through the structure members when the whole package is effectively designed; and (c) the size limits of packages cooled by thermal conduction can be significantly increased by placing auxiliary thermoelectric refrigerator units in the package walls. An equation is derived for the temperatures in packages cooled by thermal conduction alone on the assumption of a homogeneous arrangement of highly microminiaturized package components. The use of the equation for estimating package-size limitations for satisfactory cooling by conduction alone is illustrated by examples of package cooling systems. (Author)

PB 155 516 $5.60

[Electronic Systems Lab.] Mass. Inst. of Tech., Cambridge.
AUTOMATIC PROGRAMMING OF NUMERICALLY CONTROLLED MACHINE TOOLS, by Douglas T. Ross and Harry E. Pople, Jr. Interim engineering rept. 26 June-31 Dec 56, on Contract AF 33(038)24007. [1957] 57p. 3 refs. Rept. 6873-IR-1 and 6873-IR-2; AD-120 064.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Automatic, *Programming, Mathematical analysis, Mathematical computer data, *Control systems, Design, Servo systems, *Machine tools, Machine tool industry, Machine shop practice, Cybernetics, Servomechanisms, Scheduling, *Electronic systems, Numerical methods and procedures.

The possibilities are investigated of using a general-purpose digital computer for automatic programming of numerically controlled machine tools. Effort is concentrated on determining the basic principles involved in combining a human, a machine tool, and a computer into a flexible and efficient system. Initial stages of an APT system (Automatic Programmed Tool system) have been developed which embody a simulated APT computer which can be programmed by curves and regions. (Author) (See also PB 155 517)

PB 155 517 $9.10

[Electronic Systems Lab.] Mass. Inst. of Tech., Cambridge.
AUTOMATIC PROGRAMMING OF NUMERICALLY CONTROLLED MACHINE TOOLS, by Douglas T. Ross, Samuel M. Matsa and others. Interim engineering rept. 1 Jan-31 Mar 57, on Contract AF 33(038)24007. [1957] 106p. Rept. 6873-IR-3; AD-135 665.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Automatic, *Programming, Mathematical analysis, Mathematical computer data, *Control systems, Design, Servo systems, *Machine tools, Machine tool industry, Machine shop practice, Cybernetics, Servomechanisms, Scheduling, *Electronic systems, Numerical methods and procedures.

Mathematical analyses are made for 2 automatic programmed tool (APT) techniques for numerically controlled machine tools. The APT II system for programming of 3-dimensional parts in terms of curves is a new design of a previous system. Programming by 3-dimensional surface regions is the first formal presentation of the APT III system. Derivations of auxiliary techniques employed in both systems are given which include calculations for curvature, length of trail-cut vector, values for cutter-center offset, and check surface. In the APT III system a new pass is calculated from surface normals, the directed distance to any point of the part surface, local part curvature, and a memory of the previous pass. The APT II system is used to define the first pass. The basis for a convenient approximation is discussed, and a basic relation between effective length and width is established. (See also PB 155 516)

PB 155 518 $10.10

[Electronic Systems Lab.] Mass. Inst. of Tech., Cambridge.
AUTOMATIC PROGRAMMING OF NUMERICALLY CONTROLLED MACHINE TOOLS, by Samuel M. Matsa. Interim engineering rept. 1 Apr-31 Dec 57 on Contract AF 33(038)24007. [1958] 125p. 1 ref. Rept. 6873-IR-4 and 5; AD-156 059.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Automatic, *Programming, Mathematical analysis, Mathematical computer data, *Control systems, Design, Servo systems, *Machine tools, Machine tool industry, Machine shop practice, Cybernetics, Servomechanisms, Scheduling, *Electronic systems, Numerical methods and procedures.

With the surface programming system described in the main body of the report, numerical control tapes for cutting three dimensional surfaces are produced by the Whirlwind computer from the parameters of surface equations, tool geometry, required tolerance and machine feedrate, all fed into the computer on the input typewriter. This program as described in the report is a prototype, and its development, based on project research activities, is still under way. A short account of the project participation in a cooperative computer programming effort with a number of aircraft companies may be found in the appendix. (Author) (See also PB 155 517)

PB 171 814 $2.00

Harvey Aluminum, Inc., Torrance, Calif.
EVALUATION OF NUMERICALLY CONTROLLED MACHINING OF FORGING DIES, by K. A. Browning, R. Cass, and R. Berry. Final technical engineering rept. 30 Nov 57-1 June 60, on Contract AF 33(600)36136. Dec 60, 74p. AMC Technical rept. 60-7-667; AD-251 350.

DESCRIPTORS: *Milling machines, Templates, Control systems, *Dies, *Machining, Steel, Processing, Computers, Automation, Forging, Programming, Machine tools, Effectiveness, Electrodes, Airframes, Surface properties, Precision finishing, Tests.

The use of a numerically controlled milling and profiling machine has proven practicable and feasible in the machining of dies, templates, forgings, and Elox electrodes of aircraft quality. Compared to conventional methods of processing the major benefits attained are: (1) closer tolerances (+ or - 0.0005 in.) are obtained through numerical control, (2) fine finishing of die surfaces requiring little or no polishing, and (3) exact duplication of a die to the original dimension when a re-sinking operation is required, by use of the original tape. (Author)

PB 155 164 $11.00

Union Thermoelectric Corp., Forest Park, Ill.
CONTROL OF ZZ' ANGLE OF "AT" CUT QUARTZ OSCILLATOR PLATES DURING ROUGH LAPPING. Special rept. on Contract DA 36-039-sc-71061. 21 Mar 58, 145p. 2 refs. AD-157 793.

DESCRIPTORS: *Crystal oscillators, Quality control, *Quartz crystals, Processing, *Quartz, Oscillators.

An attempt was made to determine if there was a real shift upward in angle during the planetary lapping of quartz oscillator plates, and to determine the magnitude and cause. Experiments were conducted which involved the careful measurement of blanks pre-lapped to obtain good surfaces adequate for measurement, and at least one measurement after one or more further lapping stages, using planetary laps under good control. Results showed that when a planetary lapping process was under good control, random shifts of angle during lapping were more significant in magnitude than the average shift upward in angle. It was possible to indicate the minimum magnitude of the spread created by these random changes when a planetary lap was being used, and to relate the magnitude to amount of stock removed. Spreads could also be related to percentage yields at angle sort after rough lapping. It was shown that while the spread resulting from irregular and inaccurate sawing was greater than the minimum which could be attributed to lapping alone, that which resulted from lapping was of significant magnitude in terms of tighter specifications at angle sort, whether the tighter specifications resulted from an end specification of less than 0.005% frequency deviation over the temperature range - 55° to + 90°C, or from a large manufacturing allowance for errors subsequent to lapping, such as inaccurate plating to nominal frequency. Errors in the angle sort or subsequent to it would result in costly rejections of finished blanks.

MATERIALS

PB 155 580 $1.60

Diamond Ordnance Fuze Labs., Washington, D. C.
DIELECTRIC CONSTANT OF BARIUM-TITANATE AT 100 KILOBARS, by P. S. Brody and R. H. Wittekindt. 15 Mar 61, 12p. 7 refs. Technical rept. TR-917; AD-253 786.

DESCRIPTORS: *Barium compounds, *Titanates, *Dielectric properties, Determination, *Deramic materials, Shock waves, Polarization.

The dielectric constant of barium-titanate ceramic has been determined in a 100-kilobar region behind a shock front in the material. The value obtained (about 2000) is a tentative one in that it is in part dependent on two constants obtained from certain static measurements. The correctness of these values under the dynamic conditions of the experiment is thus not certain. The tentative value obtained for the dielectric constant is possibly too high. (Author)

PB 150 264 $1.10

Texas Instruments, Inc., Dallas.
QUARTERLY STATUS REPORT, by Rowland E. Johnson, T. S. Burkhalter, and G K. Teal. Rept. for 1 May-31 July 60 on Contract Nonr-3006(00). 24 Aug 60, 4p. AD-242 407.

DESCRIPTORS: *Gallium alloys, Arsenic compounds, Phosphorus alloys, Electrical properties, Preparation.

Two ingots of $GaAs_xP_{1-x}$ were prepared weighing approximately 160g. Conventional wet analytical methods of determining dopant concentration were abandoned for techniques employing Se^{75}. Ingots were sampled at five equidistant points along the ingot after doping. Ingot N was doped 3×10^{18} atoms/cc. Ingot Q was doped 1.5×10^{19} atoms/cc. Ingot R was doped 1×10^{18} atoms/cc. Electrical measurements made on samples taken from ingot N and ingot Q showed $\alpha = -162$, $\rho = 4.79 \times 10^{-1}$ for N and $\alpha = -293$, $\rho = 1.07 \times 10^{-1}$ for Q. Ingots prepared to date have contained micro voids, which make electrical measurements of α, ρ, and thermal conductivity unreliable and in most cases, impossible. The micro voids can be attributed to one of two causes. Either the vapor pressure of arsenic needs closer control (as in gallium arsenide), or the phosphorus pressure over the melt is greater than believed. Two attempts which were made to prepare $GaAs_xP_{1-x}$ by using a modified Bridgman technique proved successful with GaAs.

Fuels, Lubricants, and Hydraulic Fluids

PB 154 246 $7.60

Bell Aerosystems Co., Buffalo, N. Y.
STORABLE PROPELLANT DATA FOR THE TITAN II PROGRAM, by Ralph R. Liberto. Quarterly progress rept. no. 1, 15 June-15 Sep 60, on Contract AF 04(611)6079. Oct 60, 76p. 51 refs. Rept. no. 8111-933001; AFFTC-TR-60-62; AD-249 542.

DESCRIPTORS: *Methylhydrazines, Nitrogen compounds, *Tetroxides, Handling, Storage, *Liquid rocket propellants, *Rocket fuels, *Rocket oxidizers, Safety devices, Hazards, Physical properties, Containers, Metals, Plastics, Elastomers, Lubricants, Sealing compounds, Gaskets.

Physical properties, materials compatibility, handling techniques, flammability and autoignition limits, and procedures for storing, cleaning, and flushing of 50/50 UDMH-N_2H_4 blend and N_2O_4 are summarized in this report. The source material of this information was obtained during a one-month literature and industry survey. During this time users of these propellants and companies participating in the Titan II program were contacted. The materials compatibility data for N_2O_4 was found to be reasonably complete. The known materials compatibility data for the 50/50 UDMH-N_2H_4 blend is limited and is presented with a summary of metals compatible with N_2H_4. Data regarding the handling of N_2O_4 is based on user experience, but limited information is available for the 50/50 UDMH-N_2H_4 blend. Information presented on the handling of the fuel blend is based on experience in dealing with UDMH and N_2H_4 individually. The appendix is a U. S. Bureau of Mines report covering work done under a working agreement with Bell Aerosystems to determine the flammability and autoignition limits of the propellants. (Author)

PB 155 279 $4.60

Bell Aerosystems Co., Buffalo, N. Y.
STORABLE PROPELLANT DATA FOR THE TITAN II PROGRAM, by Ralph R. Liberto. Quarterly progress rept. no. 2, 15 Sep-1 Dec 60, on Contract AF 04(611)6079. Jan 61, 50p. 8 refs. Rept. no. 8111-933002; FTRL-TOR-61-21; AD-252 543.

DESCRIPTORS: *Liquid rocket propellants, *Methyl hydrazines, *Hydrazines, *Tetroxides, Nitrogen compounds, Rocket oxidizers, Metals, Stainless steel, Detonation, Rocket fuels, Chemical analysis, Vapor pressure. Ignition, Containers, Hazards, Storage, Handling, Coatings.

Distillation and analyses of the fuel blend fractions show that UDMH is the predominant distillate at the lower temperatures and that N_2H_4 is predominant at higher temperatures. Virtually all materials tested were compatible with the propellants except type 410 stainless steel when exposed to the fuel blend.

CATALAC paint cannot be used as a protective coating with the fuel blend at 160 F. Microseal 100-1 is not attacked by either propellant but cannot be used as a protective coating because it is porous. Alternate freezing and thawing of the fuel blend causes separation of the N_2H_4 from the UDMH. No detonations were encountered when laboratory quantities of N_2O_4 and the fuel blend were spilled. (Author)

PB 155 464 $8.10

Bureau of Mines, Pittsburgh, Pa.
RESEARCH ON THE HAZARDS ASSOCIATED WITH THE PRODUCTION AND HANDLING OF LIQUID HYDROGEN, by Michael G. Zabetakis and David S. Burgess. Rept. for Jan 58-Dec 59 on [Contract AF](33-616)58-5. June 60, 87p. 22 refs. WADD-TR-60-141; AD-239 644.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Liquefied gases, *Hydrogen, *Hazards, Handling, Production, *Heat transfer, Ignition, Combustion, Vaporization, *Rocket fuels.

The vaporization of liquid hydrogen from a surface is treated as a problem in heat transfer theory. Two extreme cases are briefly considered: (1) the transfer of heat occurs at constant temperature drop between the boiling liquid and the hot surface, and (2) the transfer of heat is limited by the rate at which it can flow to the surface through a hot insulating medium. The available data indicate that case (1) is applicable when vaporizing from a conducting surface and initially, when vaporizing from an insulating medium; case (2) is applicable after initial flash vaporization has occurred from the insulating medium. In general, flammable mixtures were found to be both above and within the visible vapor cloud. The hazards associated with the ignition of hydrogen vapor-air mixtures above a liquid hydrogen spill area were determined by (1) igniting the vapors above a dewar and (2) igniting the vapor-air mixtures above a spill area at various times following spillage of various quantities of liquid to 90 liters. Burning rate measurements were conducted on pools of various liquid fuels including hydrogen and used to correlate burning rate with the heat feed-back to a pool to maintain steady vaporization and combustion. The results of this study were used to compile a table of distances for the storage of liquid hydrogen and outline emergency procedures for the protection of personnel and equipment when an accidental spillage of hydrogen occurs. (Author)

PB 154 073 $1.60

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
INVESTIGATION OF SOME NEW FLUORONITROXY COMPOUNDS, by Jean P. Picard, Cornelius A. Conklin and others. Aug 60, 16p. 3 refs. Propellant Research section rept. no. 9; AD-251 144.

DESCRIPTORS: *Solid rocket propellants, *Rocket oxidizers, Organic halides, Metals, *Nitration, *Fluorides, *Nitrates, Alcohols, Synthesis, Propyl radicals, Pentyl radicals, Oxidizers, Combustion, Impact shock, Sensitivity, Nitrocellulose, Nitroglycerin, Physical properties, Solvent action, Solubility, Thermal stresses, Infrared spectroscopy.

The synthesis of 1H, 1H, 3H-tetrafluoro-1-propyl nitrate and 1H, 1H, 5H-octafluoro-1-pentyl nitrate from their corresponding alcohols has been accomplished with a yield of 59% and 57% respectively. Two different procedures were used for nitration. In one, the nitrating agent was the conventional mixed acid while in the other use was made of 98% nitric acid saturated with boron trifluoride. For the preparation of 3,3,3-trifluoro-1,2-propyl dinitrate a five step synthetic scheme was devised. A yield of 77% of theoretical was obtained. The three fluorinated nitrate esters are colorless, volatile liquids which burn smoothly in the bunsen flame with a green color. Although miscrible with nitroglycerin they have no plasticizing effect on nitrocellulose of 12.6% nitrogen content. The dinitrate ester shows a greater sensitivity to shock than the other two esters and it was found to explode after heating 4 seconds at 275 C. A brisance test on this nitrate failed to show any substantial explosive power. (Author)

PB 155 921 $1.60

National Research Labs., Ottawa (Canada).
INVESTIGATION OF STABILITY TEST FOR REFRIGERATOR OILS, by L. Gardner, J. Lowe, and R. B. Whyte. Mar 61, 20p. 3 refs. Mechanical engineering rept. MP-20A.

DESCRIPTORS: *Refrigeration systems, *Refrigerant compressors, Lubricantion, *Oils, Stability, Test methods.

Investigations have been made into the development of a test method for predicting the stability of refrigerator compressor lubricating oils in service which would be more realistic than normal oxidation tests. The problem, of contact between lubricant and refrigerant (Freon 12) in refrigeration systems, has been considered in developing the test method presented. (Author)

Leather and Textiles

PB 153 957 $1.60

Institute of Polymer Research, Polytechnic Inst. of Brooklyn, N. Y.
IMPROVEMENT OF THERMAL STABILITY OF TEXTILE FIBERS. Progress rept. no. 4 (Annual) 1 July 59-30 June 60, on Contract N140(138)67904B. [1960] 12p. AD-249 738.

DESCRIPTORS: *Textiles, *Fibers, Stability, Temperature, Polymers, Melting, Resistance, *Nylon, *Coatings, *Fire resistant textiles, Acrylonitriles, *Dacron, *Fire resistant coatings.

Further investigations were conducted on the grafting of polyacrylonitrile (PAN) onto surfaces of nylon fabric and work was initiated on grafting of flame-retardant polymer coatings.

PB 153 956 $5.60

Textile Research Inst., Princeton, N. J.
THERMAL CHARACTERISTICS OF COATED TEXTILE FABRICS, by Robert F. Schwenker, Jr., Louis R. Beck, Jr. and Walter J. Kauzmann. Final rept. (Including summary rept. no. 3) 1 July 56-1 July 59, on Contract N140(132)57442B. 15 Feb 60, 58p. 37 refs. AD-249 709.

DESCRIPTORS: *Textiles, *Coatings, *Elastomers, Synthetic fibers, Cotton textiles, Nylon, Orlon, Butyl rubber, Synthetic rubber, *Rubber coatings, *Pyrolysis, Temperature, Deterioration.

Coated fabric systems were prepared from three fabrics (cotton, nylon and orlon) and three elastomer coatings (butyl rubber, neoprene and hypalon) and the interactions between the fabrics and the coatings at high temperatures were studied. Weight loss, flammability and data on thermal behavior were obtained. The fabrics, coatings and fabric-coating systems were further characterized by the thermoanalytical technique of differential thermal analysis (DTA). The basic principles, techniques and procedures appurtenant to the method are discussed and new techniques for use with textiles have been developed. The measurements obtained are related to the heats of reaction and are plotted to give curves or thermograms that describe the reactions occurring at high temperature in the sample under study. Complete thermograms for all fabrics, coatings and fabric-coating systems have been obtained in an oxidizing and a nonoxidizing atmosphere in the temperature range from 50 to 550 C. The important reactions and/or transitions occurring during the thermal degradation of samples are discussed and the application of DTA in mechanism studies is considered. No interactions are indicated to occur between coatings and orlon. Interactions are shown to occur between coatings and cotton and nylon. The fabric-coating interactions are indicated to be predominantly chemical in nature. (Author)

Plastics

PB 154 492 $1.10

Army Prosthetics Research Lab., Washington, D. C.
A MATERIAL BALANCE ON THE FABRICATION OF A POROUS LAMINATE, by James T. Hill and William C. Weidmann. Nov 59, 8p. Technical rept. no. 5954; AD-233 136.

DESCRIPTORS: *Laminates, Porosity, *Ethylenes, Evaporation, *Epoxy resins, Balances, *Prosthetics, *Chlorides, Polymers.

A material balance over the fabrication system of porous laminates was made to determine whether all the trichloroethylene was evaporated from the laminate, how much remained entrapped, and the effect this has on the laminate properties. The material balance also showed the exact amount of resin incorporated in the cured laminate. A porous epoxy laminate was prepared in the usual manner. The laminate was precured for 100 min at 75°F. and then cured for 2 hr at 70°C. All materials used were weighed to ±0.5 grams. As a result of these measurements, a material balance over the entire process was prepared. This information will aid in determining possible improvement of the laminating process. A flow sheet of the process is included, as are the material balances.

PB 171 811 $1.00

Naval Ordnance Lab., White Oak, Md.
THE EFFECT OF EXPLOSIONS ON PLASTICS, by H. A. Perry, Jr. 28 May 56, 36p. 6 refs. NAVORD rept. 4308; AD-105 971.

DESCRIPTORS: *Plastics, Explosion damage, Deformation, Lead compounds, Azides, Detonation, Shock waves.

Twelve plastics of various types were molded in conical form and subjected to shocks generated by charges of lead azide detonated on their bases. The charge weights and specimen temperatures were varied. Ethyl cellulose and a tirecord filled phenolic showed outstanding resistance to fracture and flow under these conditions. Ethyl cellulose showed exceptional transmissivity to shock waves. By contrast, polyethylene showed extensive plastic flow and internal energy absorption, particularly at +160°F. Rigid polystyrene flowed at elevated temperature, whereas polymethylmethacrylate remained brittle. The polyesters, both rigid and flexible, shattered more extensively than the other materials. Fibrous fillers aided in holding shattered specimens together. The test appears to be useful for the selection of materials to resist fracture or flow under high energy shock loads of short duration, or to absorb or transmit shock waves, as for example, the materials to be used in the construction of hyperballistic models and sabots. (Author)

MATHEMATICS

PB 154 890 $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
THE NUMERICAL SOLUTION OF FREDHOLM INTEGRAL EQUATIONS OF THE FIRST KIND, by John T. Jefferies and Frank Q. Orrall. Nov 60, 13p. 2 refs. GRD Research Notes no. 48; AFCRL-TN-60-811; AD-250 862.

This report released for sale to the public 2 June 61.

DESCRIPTORS: *Integral equations, Numerical analysis, Theory.

A method is proposed for finding smooth solutions of Fredholm's Integral Equation of the First Kind. Examples of the method from the theory of radiative transfer are given. (Author)

PB 149 802 $4.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
OCCUPATION TIME LAWS FOR BIRTH AND DEATH PROCESSES, by Samuel Karlin and James McGregor. Technical rept. no. 24 on Contract Nonr-225(28). 29 July 60, 45p. 14 refs. AD-240 478.

DESCRIPTORS: *Statistical processes, Statistical functions, Theory.

PB 149 965 $7.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
ON THE MOTIONS OF PARTICLES IN EUCLIDEAN AND NONEUCLIDEAN SPACES UNDER CERTAIN CONSERVATIVE FORCE FIELDS, by Richard L. Van De Wetering. Technical rept. no. 90 on Contract Nonr-225(11). 29 July 60, 80p. 8 refs. AD-240 926.

DESCRIPTORS: *Geometry, Equations, *Vector analysis, *Mechanics, Groups (Mathematics), Transformations (Mathematics).

Consideration is given to the motions of a particle under the influence of force fields which are generalizations of those of the system $X = a$ where a represents an infinitesimal translation. The concept of infinitesimal translations is generalized in two different ways. One way depends on some group theoretical properties of the translation group, and the other way depends on the fact that the infinitesimal translations can be derived from a harmonic potential function. Some of the concepts which provide the basis for these generalizations are discussed. (Author)

PB 149 951 $4.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
REGRESSION ANALYSIS OF CONTINUOUS PARAMETER TIME SERIES, II, by Emanuel Parzen. Technical rept. no. 35 on Contract Nonr-225(21), 28 July 60, 50p. 17 refs. AD-240 429.

DESCRIPTORS: *Statistical analysis, *Series, Functional analysis, Statistical processes.

The problem of regression analysis of time series is treated, using Hilbert space techniques, in a manner which applies simultaneously to discrete and continuous parameter time series, and also to multiple time series. The idea of Hilbert space representation of a time series (the reproducing kernel Hilbert space representation) is discussed and examples are given. A formula is obtained for the probability density functional of a normal time series. The problem of maximum likelihood estimation of the mean value function of a normal time series is treated, and the minimum variance unbiased linear estimation of the mean value function is discussed. Tests of hypothesis and simultaneous confidence bands are given for mean value functions. A method of iteratively evaluating reproducing kernel inner products is described. (See also PB 149 750)

PB 155 631 $1.10

California U., Berkeley.
DERIVATIONS OF COMMUTATIVE BANACH ALGEBRAS, by Philip C. Curtis, Jr. Technical rept. no. 1 on Contract AF 49(638)859. Feb 61, 7p. 2 refs. AFOSR-131; AD-254 228.

DESCRIPTORS: *Algebras, Algebraic topology, Operators (Mathematics), Theory.

PB 150 375 $7.60

California U., Berkeley.
INFINITELY MULTIPLE VALUED HARMONIC FUNCTIONS IN SPACE WITH TWO BASE BRANCH CURVES OF ORDER ONE. PART III, by Griffith C. Evans. Technical rept. no. 12 on Contract Nonr-222(62). July 60, 77p. 5 refs.

DESCRIPTORS: *Functions, *Potential theory, Transformations (Mathematics), Integrals, Theory.

Contents:
Summary, symbols, bibliography
Extension of definition of energy; relation $\mathcal{E} = J$
Equilibrium distributions on disjoint bounded closed sets
Surfaces of minimum energy, of given space curve boundaries $\overline{s}_1$, $\overline{s}_2$, for assigned potential values V_1, V_2
Appendix: Existence theorem based on sequences of multiple valued subharmonic functions. (See also PB 144 552)

PB 155 306 $3.60

California U., Los Angeles.
NONSTATIONARY SIGNAL FLOW GRAPH THEORY, by E. B. Stear and A. R. Stubberud. Rept. on Contract AF 49(638)438. Nov 60, 38p. 7 refs. Dept. of Engineering rept. no. 60-64; AFOSR-161; AD-252 813.

DESCRIPTORS: Simultaneous equations, *Differential equations, Equations, Numerical methods and procedures, Integral transforms.

The use of signal flow graphs to aid in the analysis of non-stationary systems is described. The problems which arise in the reduction of the flow graph are described; and techniques which can be used to aid in the reduction are developed, which are quite detailed when applied to specific systems. Operating on non-stationary systems is a complex process and no known general procedure provides the simplicity which can be obtained in the stationary case through the Laplace transformation. The techniques described are no more general than the techniques for the analysis of ordinary linear differential equations; their real advantage lies in the fact that the logical procedures of analysis which have been developed for stationary signal flow graphs can be extended to non-stationary signal flow graphs. (Author)

PB 150 379 $2.60

Columbia U., New York.
A MARTINGALE SYSTEM THEOREM AND APPLICATIONS, by Y. S. Chow and Herbert Robbins. Rept. on Contract Nonr-266(59). 26 July 60, 22p. 3 refs. CU-19-60-Nonr-266(59)MS; AD-241 683.

DESCRIPTORS: *Statistical analysis, Probability.

PB 150 205 $1.60

Columbia U., New York.
SAMPLING PERMUTATIONS FOR NONPARAMETRIC METHODS, by T. W. Anderson. Rept. on Contract Nonr-266(33). 27 July 60, 13p. 1 ref. CU-44-60-Nonr-266(33)MS; AD-241 727.

DESCRIPTORS: *Statistical analysis, *Sampling, *Combinatorial analysis.

PB 150 102 $1.10

Electronics Research Lab., U. of California, Berkeley.
A NOTE ON THE LAW OF LARGE NUMBERS FOR DISCRETE MARKOV PROCESSES, by Melvin Katz, Jr. and A. J. Thomasian. Rept. on Contract Nonr-222(53). 1 July 60, 5p. 2 refs. Series no. 60, issue no. 291; AD-242 368.

DESCRIPTORS: *Statistical processes, Probability, Number theory.

An exponential bound is obtained for the law of large numbers for $S_n = \sum_{k=1}^{n} f(X_k)$ where $\{X_k : k = 1, 2, \cdots\}$ is a discrete parameter Markov process satisfying Doeblin's condition and f is a bounded, real-valued, measurable function. (Author)

PB 155 076 $2.60

Institute for Advanced Study, Princeton, N. J.
EXTENSION OF SHEAVES OF ALGEBRAS, by John W. Gray. Rept. on Contract DA 36-034-ORD-2693, June 59, 27p. 4 refs. OOR rept. no. 2096:1; AD-217 830.

DESCRIPTORS: *Algebras, *Algebraic topology, Groups (Mathematics), Theory.

Since sheaves of modules over a fixed sheaf of rings R on a topological space X form an abelian category, the set of equivalence classes of extensions of a sheaf A" by a sheaf A', of exact sequences $O \to A' \to A \to A'' \to O$, is in 1-1 correspondence with the first derived functor $Ext^1_R(A'', A')$ of $Hom_R(A'', A')$. Similarly, there is a classification theorem for extensions of an associative algebra Λ by a kernel A with trivial multiplication which asserts that the set $F(\Lambda, A)$ of equivalence classes of such extensions is in 1-1 correspondence with $Ext^2_{\Lambda^e}(\Lambda, A)$, where Λ^e denotes the enveloping algebra of Λ. It is shown that in general this does not hold for sheaves of associative algebras, but that under appropiate hypotheses there is an exact sequence $H^1(X, A) \to F(\Lambda, A) \to Ext^2_{\Lambda^e}(\Lambda, A) \to H^2(X, A) \to \cdots$ where the symbols refer to sheaves of algebras and where $H^*(X, A)$ is the Cech cohomology of X with coefficients in A.

PB 155 881 $2.60

Iowa State U., Iowa City.
OSCILLATION CRITERIA FOR SELF-ADJOINT DIFFERENTIAL SYSTEMS, by William T. Reid. Technical rept. no. 1 on Contract AF 49(638)994. Jan 61, 23p. 21 refs. AFOSR-132; AD-254 704.

DESCRIPTORS: *Differential equations, Calculus of variations, Matrix algebra, Theory.

For a differential system with complex coefficients that is of the general form of the accessory differential equations for a calculus of variations problem of Lagrange or Bolza type that is identically normal, variational methods are employed to establish certain oscillation criteria involving associated two-point boundary problems. (Author)

PB 154 948 $1.10

Kenyon Coll. [Gambier; Ohio].
RESEARCH IN BILINEAR FUNCTIONALS, by William R. Transue. Rept. no. 1 (Final) 1 July 53-1 July 59, on Contract DA 33-019-ORD-1265. [1959] 5p. 8 refs. OOR Proj. 913; AD-219 398.

DESCRIPTORS: *Functional analysis, *Integrals, Measure theory, Transformations (Mathematics).

PB 149 795 $1.10

Michigan U. Coll. of Literature, Science, and the Arts, Ann Arbor.
ON A PROBLEM OF TARSKI, by J. Richard Buchi. Rept. on Contracts DA 36-039-sc-78057 and Nonr-1224(21). July 60, 9p. 11 refs. 03105; 2794-13-T; AD-241 159.

DESCRIPTORS: *Metamathematics, *Mathematical logic.

An effective method for deciding truth of sentences in sequential calculus is outlined. This, according to R. M. Robinson [Proc. Am. Math. Soc. 9:238-242, 1958] answers a question of Tarski's. In addition, a rather complete understanding of definability in sequential calculus is obtained. (Author)

PB 154 947 $2.60

Minnesota U., Minneapolis.
A TWO-DIMENSIONAL OPERATOR IDENTITY WITH APPLICATION TO THE CHANGE OF SIGN IN SUMS OF RANDOM VARIABLES, by Glen Baxter. Technical rept. no. 9 on Contract AF 18(603)30. 1 July 59, 24p. 7 refs. AFOSR-TN-59-691; AD-226 551.

DESCRIPTORS: *Statistical analysis, *Sequences, Statistical distributions, *Operators (mathematics), Matrix algebra, Algebras.

Let $[X_k]$ be a sequence of independent, identically distributed random variables and let $S_o = 0$; $S_1 = X_1; \ldots;$ $S_n = X_1 + \ldots + X_n$. A certain matrix factorization is shown to be related to the number of changes of sign among $S_o, S_1, \ldots, S_n$. The results are treated as statements about operators in Banach algebras. Two examples are considered; the symmetric exponential distribution and the Bernoulli variable case. (Author)

PB 148 925 $5.60

Minnesota U., Minneapolis.
ON THE USE OF IDEMPOTENT MATRICES IN THE TREATMENT OF LINEAR RESTRICTIONS IN REGRESSION ANALYSIS, by John S. Chipman and M. M. Rao. Technical rept. no. 10 on Contract Nonr-2582(00). [1960] 55p. 31 refs. AD-239 245.

DESCRIPTORS: *Analysis of variance, Probability, *Matrix algebra.

A unified treatment of the problem of estimation and hypothesis testing in linear regression analysis is presented. The estimation of regression coefficients subject to a set of linear restrictions, according to the Markov criterion of best linear unbiasedness and the least squares criterion, respectively is considered. Also considered are the testing of a set of linear restrictions on the coefficients of a regression equation and the testing of one set of linear restrictions subject to another set being true. The derivation of the principal theorems for idempotent matrices are given. Since idempotent transformations may be viewed geometrically as projections in linear spaces, the geometric interpretation of the results is presented. (Author)

PB 154 310 $1.10

Northwestern U., Evanston, Ill.
STARLIKE HYPERGEOMETRIC FUNCTIONS, by W. T. Scott and E. P. Merkes (Marquette U.). Technical rept. no. 1 on Contract AF 49(638)888. Dec 60, 5p. 5 refs. AFOSR 14; AD-249 813.

DESCRIPTORS: *Special functions, Complex numbers, Continued fractions, Series, Transformations (Mathematics), Convex sets.

PB 154 781 $3.60

Travelers Weather Research Center, Hartford, Conn.
CALIBRATATION OF QUALITATIVE OR QUANTITATIVE VARIABLES FOR USE IN MULTIPLE-GROUP DISCRIMINANT ANALYSIS, by Joseph G. Bryan. Scientific rept. no. 2 on Contract AF 19(604)5207. Jan 61, 31p. 6 refs. AFCRL-200; AD-251 139.

DESCRIPTORS: *Statistical processes, Statistical analysis, Matrix algebra, Sequential analysis.

Three limitations on the application of multiple discriminant analysis in certain statistical problems are discussed. These are: (1) difficulty in including qualitative antecedent variables in the analysis, (2) failure of quantitative variables to discriminate in a linear fashion, and (3) multivaluedness of antecedent variables within consequent groups. A technique for optimal assignment of numerical scale values to antecedent classes is proposed for overcoming these limitations. The technique evolves essentially as a calibration procedure. It depends only upon and exhausts all the information in the antecedent-class, consequent-group contingency table. A straightforward procedure for carrying out the computations is outlined in detail. The problem of separate vs simultaneous calibration is resolved, and the implications of the use of calibrated variables in a screening (selection of antecedent variables) procedure examined. (Author)

Computing Devices

PB 150 142 $6.60

Aeronutronic, Newport Beach, Calif.
A MAGNETIC INTEGRATOR FOR THE PERCEPTRON PROGRAM, by J. K. Hawkins and C. J. Munsey. Annual summary rept. for 1 Apr 59-31 May 60 on Contract Nonr-2913(00). 30 July 60, 63p. 11 refs. Publication no. U-603; AD-241 392.

DESCRIPTORS: *Mathematical logic, *Computers, Learning, *Integrators, Data storage systems, Design, Programming, Digital computers.

The most significant result of the research program described is the construction and successful operation of a "learning" machine, employing magnetic integrators as storage for experience data. The machine is capable of learning all possible linear-logic functions of up to four input variables, and some functions of five variables. The machine is constructed along the lines of the association-response portion of the Perceptron system, differing only in detail with respect to growth logic, logical levels, etc. Successful operation of the machine has demonstrated the practicability of constructing Perceptron-type systems using the magnetic integrator component developed. Fabrication costs of the component permit construction of moderately large perceptron-type systems capable of operating at high learning rates. The configuration and important characteristics of the learning machine and the integrator component are summarized. A brief report on a company-sponsored computer program which can simulate a variety of similar learning machines is included because of its bearing on the behavior of the hardware system. (Author)

WAPD-TM-243 $2.00

Bettis Atomic Power Lab., Pittsburgh, Pa.
KOAD-1-A DIGITAL PROGRAM TO CALCULATE STRESSES AND DEFLECTIONS IN LINEAR ELASTIC STRUCTURES UNDER THERMAL DISTORTION, PRESSURE, AND APPLIED LOADS, by C. M. Friedrich. Rept. on Contract AT-11-1-GEN-14. Mar 61, 69p.

WAPD-TM-269 $1.50

Bettis Atomic Power Lab., Pittsburgh, Pa.
REFERENCE MANUAL FOR THE BETTIS OPEN SHOP SYSTEM (BOSS-2) AS USED WITH THE PHILCO-2000, by D. E. George. Rept. on Contract AT-(11-1)-GEN-14. Apr 61, 58p.

PB 153 773 $3.60

Computation Center, Carnegie Inst. of Tech., Pittsburgh, Pa.
SYMBOL MANIPULATION BY THREADED LISTS, by Alan J. Perlis and Charles Thornton. Technical rept. no. 1 on Contracts Nonr-760(18) and DA 36-039-sc-75081. 1 Mar 60, 38p. 4 refs. AD-233 298.

DESCRIPTORS: Digital computers, *Programming, Human engineering, Algebra, *Coding.

An addition is presented to the list structure languages which is expected to add to programming flexibility, while simplifying machine processing of lists. This is done by the use of threaded lists. A threaded list is a list structure in which the last element of each list specifies the location of the head of the list of which it is the terminal member. The advantage of this structure is that it permits the definition of various modes for sequencing through lists without requiring the use of the usual push-down lists for retaining sequencing information. This corresponds, in the representation of programs by list structures, to the representation of all computable functions iteratively, rather than recursively. The examples given of manipulation of threaded lists are from elementary algebra. The striking result is that algebraic operations which are distant from machine primitives can be built up quite easily using very few primitives. Aside from the computing simplicity which results from iterative operation, it is noted that the human programming task is lightened, since the processes which can be defined are similar to those often used by humans in the manipulation of symbols.

PB 149 173 $9.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
SOME PRINCIPLES OF REORGANIZATION IN SELF-ORGANIZING SYSTEMS, by M. L. Babcock, A. Inselberg and others. Technical rept. no. 2 on Contract Nonr-1834(21). 24 June 60, 112p. 24 refs. AD-239 721.

DESCRIPTORS: *Computers, *Biology, Medical research, Instrumentation, Design, Circuits, Information theory, Electrical networks.

Contents:
Property detector nets and fields
- Interaction in a one-dimensional layer
- Isotropic action functions
- Anisotropic action function
- Counting networks

Connection possibilities and distinguishable stimulus patterns in cellular layers
- The number of connection possibilities in a cellular layer
- The number of distinguishable stimulus patterns in a cellular layer

Notes on the synthesis of property filters
- Signal-pattern analogs
- A redundancy-reducing transformation

Resolution and circuitry of non-sequential property filters
Property filtration in the organism
- Biological support for synthetic devices
- Property filters, born, not built

PB 154 904 $9.60

Electronic Systems Lab., Mass. Inst. of Tech., Cambridge.
A PULSED ANALOG AND DIGITAL COMPUTER FOR FUNCTION GENERATION, by Joseph Herbert Binsack. Master's thesis. Scientific rept. no. 2 (8494-R-2) on Contract AF 19(604)6654. Oct 60, 116p. 20 refs. AFCRL-TN-60-1111.

DESCRIPTORS: *Analog computers, *Digital computers, Monitors, Control, Coding, Functions, Electronic circuits.

A Pulsed Analog Computer has time-shared analog computing elements. Previously, a family of high-speed pulsed analog computing elements (operational amplifier, decoder, sample and storage gates, etc.) capable of operation in 10 micro sec was developed. Tests of these elements are described under the control of a program stored in the memory of a general purpose digital computer, the TX-0. The combined system, which includes a sequential digital machine to assist in the interpretation of this stored program and the transfer of data between the analog and digital domains, is called the Pulsed Analog and Digital Computer (PADIC). Sequential analog operations can be performed at a rate of 80,000 per second, with accuracies approaching 1%. The design procedures can be used for construction of larger systems for any purpose. As a test problem, the generation of an arbitrary function of a single variable stored as discrete points in the digital memory was accomplished using the experimental PADIC system and compared with the digital solution. Each pulsed-analog function interpolation was completed in 162 micro sec including memory accesses and this time can easily be reduced. (Author)

HW-68527 $1.50

Hanford Atomic Products Operation, Richland, Wash.
LOLA - A MULTI-DIMENSIONAL OPTIMIZATION CODE FOR THE IBM 709-7090, by M. R. Egan and C. N. Knudsen. Rept. on Contract AT(45-1)-1350. Feb 61, 61p.

PB 155 571 $9.10

Instrumentation Lab., Mass. Inst. of Tech., Cambridge.
DIGITAL METHODS OF SYSTEM SIMULATION AT THE COMPONENT LEVEL, by Glen E. Martin and Thomas F. Droege. Master's thesis. Rept. on Contract AF 04(645)9. June 58, 110p. 16 refs. Rept. T-159; AFBMD Document no. 8-11, 398; AD-221 503.

DESCRIPTORS: *Digital computers, Simulation, *Programming.

A study was made of the feasibility of simulating systems on a digital computer by means of an executive routine which monitors arbitrary subroutines each of which simulate the characteristics of a particular component. A compiling and executive routine (MADCAP) and several subroutines were written. Using these routines, programming for system simulation is essentially reduced to the identification of outputs of components with inputs of others as shown on a block diagram of the system. Several positional servomechanisms were successfully simulated. This method was determined to be feasible, and shown to be a practical approach to system simulation. (Author)

PB 150 113 $4.60

Stanford Electronics Labs., Stanford U., Calif.
ADAPTIVE SAMPLED-DATA SYSTEMS, by B. Widrow. Rept. on Contract Nonr-225(24). 15 July 60, 44p. 13 refs. Technical rept. no. 2104-1; AD-243 265.

DESCRIPTORS: Data, Sampling, Control systems, *Servo systems, Design, Synthesis, *Data processing systems.

An adaptive sampled-data system model that is quasi-statically linear and makes use of performance feedback for self-optimization is evaluated. The goal of adaptation is to minimize a mean-square error. Analytical results derived from the model show that misadjustments are inversely proportional to adaptation rates. Adaptation taking place at different administrative levels within the same system may be treated analytically as separate phenomena because of the great disparities in the averaging times. Misadjustments developed at the various levels add. The adaptive model and the analytical results comprise a small-signal linear theory of adaptation. As such, this theory will find application in describing a wide class of adaptive processes when these processes are near to being optimized. (Author)

PB 149 564 $14.00

Stanford Electronics Labs., Stanford U., Calif.
NEURISTOR STUDIES, by H. D. Crane. Rept. on Contract Nonr-225(24). 11 July 60, 202p. 14 refs. Technical rept. no. 1506-2.

DESCRIPTORS: *Digital computers, *Electric discharges, Propagation, Conductors, Electrical networks, Theory, *Coupling circuits.

Potentialities of the neuristor are explored for use in the construction of an electronic computer in which good conductors, or wires, are not available for carrying signals. A neuristor is defined as a device having the form of a one-dimentional channel along which signals may flow, the signals taking the form of propagating discharges having the following properties: (1) threshold stimulability; (2) uniform velocity of propagation; (3) attenuationless propagation; and (4) refractory period following the passage of a discharge, after which the neuristor can again support a discharge. Two devices are cited as members of this class: the common chemical fuse, and the axon process (nerve fiber) of a neuron. An investigation is presented of the logical power and development of specific techniques of logic realization using neuristors. To develop neuristor networks, the allowed modes of interconnection of such devices must be specified. Two basic types of junctions are indicated; a T junction and an S junction. All network synthesis is then a game on these two (junction) symbols. The game and logical possibilities are studied in detail. It is shown that, in addition to realizing all of the conventional logic network properties with neuristors, properties not having simple direct analogs may also be realized. Two properties of importance are: (1) the ability to realize any nonplanar logic network on a two-dimentional physical structure, and (2) the ability to obtain controllable probabilistic gate structures with exactly the same basic neuristor device. (See also PB 153 785)

PB 150 202 $6.60

Stanford Electronics Labs., Stanford U., Calif.
A PROPOSED SYSTEM OF REDUNDANCY TO IMPROVE THE RELIABILITY OF DIGITAL COMPUTERS, by W. H. Pierce. Rept. on Contract Nonr-225(24). 29 July 60, 61p. 7 refs. Technical rept. no. 1552-1; AD-241 645.

DESCRIPTORS: *Digital computers, Reliability, Communication systems.

The use of redundancy to improve reliability of digital systems is investigated for cases in which the redundancy is the simultaneous calculation of a digit by paral lel devices. The purpose of the investigation is primarily to develop a systems theory for the use of mass produced assemblies of microelectronics elements for digital computers. The results are general, however, and suitable for some types of redundancy in communications systems. Binary systems which use a decision procedure of the optimum type, or near optimum systems of the same configuration but different weights, are analyzed assuming statistical independence of errors. The use of decision elements, which carry out the decision in real time, is proposed on low levels of organization, and error in these elements can be tolerated. A design procedure for using multiplexing is given. The inherent practically of multiplexing is demonstrated by an appendix giving circuit implementations of the proposed decision element. (Author)

PB 152 407 $3.60

Wayne State U., Detroit, Mich.
SUMMARY OF THE PROCEEDINGS OF THE WAYNE STATE UNIVERSITY CONFERENCE OF FEDERALLY SPONSORED MACHINE TRANSLATION WORKERS, HELD AT PRINCETON INN, PRINCETON, NEW JERSEY, JULY 18-22, 1960.

DESCRIPTORS: *Machine translation, Conferences.

MECHANICS

PB 156 090 $1.60

David Taylor Model Basin, Washington, D. C.
HYDROSTATIC PRESSURE TESTS OF AN UNSTIFFENED CYLINDRICAL SHELL OF A GLASS-FIBER REINFORCED EPOXY RESIN, by John G. Pulos and John E. Buhl, Jr. Apr 60, 15p. 2 refs. Rept. 1413.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Cylindrical bodies, *Hydrostatic pressure, Tests, materials, *Epoxy resins, Load distribution.

An unstiffened cylindrical shell of 32.67-in. mean diameter, built up of layers of an epoxy resin tape reinforced with glass fibers, was tested to collapse under external hydrostatic pressure. The shell structure failed at a pressure of 3735 psi, which is in good agreement with the pressure calculated from the elastic shell-buckling equations of von Mises. A longitudinal tear accompanied by some delamination of the layers was observed over the entire length of the cylinder. (Author)

Aerodynamics and Pneumatics

PB 154 921 $3.60

Arnold Engineering Development Center [Tullahoma, Tenn.]
AIR LIQUEFACTION EFFECTS ON THE AERODYNAMIC CHARACTERISTICS OF THE AGARD CALIBRATION MODEL B AT MACH NUMBERS 5 and 8, by C. R. Fitch, J. D. Coats and L. L. Trimmer. Rept. on ARO, Inc. Contract AF 40(600)800. Feb 61, 34p. 5 refs. AEDC-TN-61-24; AD-251 529.

DESCRIPTORS: *Hypersonic flow, *Aerodynamic configurations, Wind tunnel models, Cylindrical bodies, Tests, Liquid air, Hypersonic wind tunnels, Liquified gases.

An investigation to determine the influence of air liquefaction on wind tunnel data was conducted at Mach numbers 5 and 8. The test included a determination of air liquefaction effects both on test section flow properties and on the aerodynamic characteristics of the AGARD Calibration Model B. Force and pressure distribution data were obtained at Reynolds numbers ranging from 6.5 x 10 to the 6th power to 22 x 10 to the 6th power based on model length. All phases of the test were conducted at temperatures ranging from above to well below the theoretical saturation values. The effective test section Mach numbers obtained from pitot and static pressure measurements were in agreement with theoretical estimates. The force and pressure data indicate that reliable test results can be obtained at temperatures below the theoretical saturation point provided accurate base pressure data are not required. (Author)

PB 155 348 $2.60

Arnold Engineering Development Center [Tullahoma, Tenn.]
BASE-PRESSURE MEASUREMENTS WITH WIRE-SUPPORTED MODELS AT SUPERSONIC SPEEDS, by J. Don Gray. Rept. on ARO, Inc. Contract AF 40(600)800. Mar 61, 22p. 5 refs. AEDC-TN-61-23; AD-252 548.

DESCRIPTORS: *Blunt bodies, Measurement, *Conical bodies, Cylindrical bodies, Tests, *Supersonic wind tunnels, *Pressure, Wire, Configuration, Nozzles, Model tests, Schlieren photography, Supersonic flow, Wind tunnel models, *Ogives.

Base pressure measurements were made with an ogive cylinder and a blunt, boat-tailed cone at Mach 4 to appraise the effects of small wire supports. Some measurements with a much larger blunted cone were made at Mach 3.5 and 5. The tests covered a Reynolds number range from about 0.06 to 0.48 times 10 to the 6th power per inch. It was found that the small wire supports generally reduced the base pressure ratio below that obtained with a small sting support. The results for the ogive-cylinder model indicated that when transition was situated on the model the addition of wires introduced negligible interference. (Author)

PB 154 920 $6.60

Arnold Engineering Development Center [Tullahoma, Tenn.]
COMPARISON OF THE AERODYNAMIC CHARACTERISTICS OF AGARD MODEL A FROM TESTS IN 12-IN. SUPERSONIC WIND TUNNELS, by C. J. Schueler. Rept. on ARO, Inc. Contract AF 40(600)800. Feb 61, 65p. 28 refs. AEDC-TN-61-8; AD-251 477.

DESCRIPTORS: *Bodies of revolution, Ogives, *Parabolic bodies, Wind tunnel models, Aerodynamic configurations, Cylindrical bodies, Blunt bodies, Supersonic flow, *Aerodynamics, *Supersonic wind tunnels, Lift, Drag, Measurement, *Supersonics.

The aerodynamic characteristics of AGARD Calibration Model A were investigated at Mach numbers from 1.5 to 5 in 12-in. and 40-in. supersonic wind tunnels. The tests covered a Reynolds number range from 10 to the 6th power to 1.3 x 10 to the 7th power based on the body length and an angle-of-attack range from -4 to 6 deg. Measurements were obtained to evaluate the AGARD model specifications with regard to sting length and diameter. Comparisons of lift, drag, and pitching-moment results are discussed with emphasis placed on the importance of transition measurements. Modifications to the stilling chamber of the 12-in. tunnel are shown to have a significant effect on drag and base-pressure measurements at Mach number 2. (Author)

PB 154 230 $8.10

Arnold Engineering Development Center. [Tullahoma, Tenn.]
DEVELOPMENT OF CAPACITANCE AND INDUCTANCE DRIVEN HOTSHOT TUNNELS, by J. Lukasiewicz, W. G. Harris (Boeing Airplane Co.) and others. Rept. on ARO, Inc. Contract AF 40(600)800. Jan 61, 82p. 18 refs. AEDC-TN-60-222; AD-249 421.

DESCRIPTORS: *Wind tunnels, *Hypersonic wind tunnels, Design, *Inductance, Capacitors, Air, Nitrogen, Temperature, Pressure, Heat transfer, *Heating, *Electric arcs, Measurement, Thermodynamics, Tests, Data, Fluid flow, Gas flow, Gases.

Results of measurements made over the past year in the arc chambers and test sections of the hotshot-type wind tunnels of the USAF-ARDC Arnold Engineering Development Center and of the Boeing Airplane Company are presented for operation with air and nitrogen at stagnation temperatures up to 4000 degrees K and maximum reservoir pressures up to 40,000 psi. Data on contamination of the flow with arc-chamber components, throat erosion, flow distribution in the test section, effects on heat transfer and force measurements are discussed with particular reference to arc-chamber design. (Author)

PB 155 411 $3.60

Arnold Engineering Development Center [Tullahoma, Tenn.
EXPERIMENTAL INVESTIGATION OF FREE JET IMPINGEMENT ON A FLAT PLATE, by R. C. Bauer and R. L. Schlumpf. Rept. on ARO, Inc. Contract AF 40(600)800 S/A 11(60-110). Mar 61, 34p. 3 refs. AEDC-TN-60-223; AD-253 229.

DESCRIPTORS: Schlieren photography, Pressure, Distribution, Nozzles, Shock waves, Configuration, Theory, *Supersonic flow, *Exhaust gases, *Jets, High altitude, Simulation, *Sheets.

Schlieren photographs and static pressure distributions along a flat plate partially immersed in a free jet from a Mach 2.0 (γ = 1.4) nozzle are presented. These data were obtained using unheated air and with the plate located at two positions and three angles relative to the nozzle centerline. Various highly underexpanded jets were produced by varying the ratio of nozzle total pressure to cell pressure. The location of the maximum pressure on the plate was found to correspond to the theoretical impingement point for flow conditions which produce a single shock wave at the plate. Extensive data are presented showing flow conditions and plate configurations that produced double shock waves at the impingement point with and without separation downstream of the second shock wave. Two-dimensional shock-wave theory is shown to be invalid for predicting the maximum pressure rise through the free jet impingement zone. (Author)

PB 155 282 $7.60

Arnold Engineering Development Center [Tullahoma, Tenn.]
THEORETICAL PREDICTIONS OF INVISCID PRESSURE DISTRIBUTION AND HEAT TRANSFER RATES OVER SIMPLE BODIES IN AIR AND COMBUSTION GAS TEST MEDIA AT HYPERSONIC SPEEDS, by K. E. Tempelmeyer, M. H. Nesbitt and L. R. Carpenter. Rept. on ARO, Inc. Contract AF 40(600)800. Mar 61, 72p. 24 refs. AEDC-TN-60-207; AD-252 561.

DESCRIPTORS: Gas flow, *Hypersonic flow, *Heat transfer, Aerodynamic heating, Gases, Simulation, Combustion, *Load distribution, Aerodynamic configurations, Pressure, Theory.

Methods are described which are employed to predict the pressure and heat transfer distributions over simple bodies in air and combustion gas test media as well as techniques which have been employed to account for vibrational real gas effects. Test results expected for the two test media are discussed. For the flow conditions assumed, the water component of the combustion gases would be expected to condense. Condensation effects were not included in the present analysis, and differences noted between the two test mediums would be only those attributed to their different thermal and transport properties. (Author)

PB 156 095 $1.60

Avco-Everett Research Lab., Mass.
RATE OF IONIZATION BEHIND SHOCK WAVES IN AIR, by S. C. Lin. Rept. on Contracts AF 04(647)278 and DA 19-020-ORD-4862. Dec 59, 19p. 20 refs. Research note 170; AFBMD Document no. 60-937; AFBMD-TN-60-6; AD-234 031.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Shock waves, *Gas ionization, Air, Hypersonics, High altitude, *Shock tubes, Measurement.

The electron density profile behind normal shock waves in air at density corresponding to an altitude of 250,000 ft (initial shock tube pressure, p_1 = 20 microns Hg) and in the velocity range $10,000 < U > 25,000$ ft/sec has been measured. The preliminary results, which agreed grossly with a theoretical prediction by Lin and Teare [Bull. Am. Phys. Soc. II, 4:195, 1959], indicated that at satellite velocity ($U \approx 25,000$ ft/sec), the thermal ionization process will be completed at a distance of about 1 cm behind the shock front; while at a velocity of 15,000 ft/sec the corresponding distance will be about 10 cm. At other altitudes the corresponding ionization distance may be scaled inversely to the atmospheric density since all the collision processes which govern the initial rise of the electron density profile are binary. (Author)

PB 155 392 $6.60

California U., Berkeley.
PERFORMANCE ANALYSIS OF SHOCK TUBES WITH AREA CHANGE AT THE DIAPHRAGM SECTION, by A. K. Oppenheim and P. A. Urtiew. Technical note DR-10 on Contract AF 49(638)166. Dec 60, 69p. 5 refs. AFOSR-56; AD-253 242.

DESCRIPTORS: *Shock tubes, Shock waves, Diaphragms (Mechanics), Vector analysis, Configuration, Gas flow, Nozzles.

The report is concerned with the determination of the wave pattern obtained in shock tubes with essentially a different cross section on the two sides of the diaphragm. The analysis is performed by the use of the Vector Polar Method which yields information on the final wave pattern and the stationary states produced by it without considering the details of the wave generation processes. The results obtained for a perfect gas with constant specific heats are summarized on a single chart whose coordinates are the area ratio and the diaphragm pressure ratio, from which the wave pattern obtained with any combination of these parameters can be read off directly. The results cover the range of area ratios (low to high pressure side) from 0.1 to 10 and diaphragm pressure ratios up to 150:1 for both the case of single area changes, i.e. divergences or convergences, and that of a convergent-divergent nozzle at the diaphragm section. Included also is an illustrative problem of different gases on the two sides of the diaphragm. (Author)

PB 155 078 $3.60

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
FLUTTER ANALYSIS OF A SUPERSONIC RING WING, by Peter Crimi. Rept. on Contract AF 18(600)1523.]1959[39p. 12 refs. AFOSR-TN-59-685; AD-227 075.

DESCRIPTORS: *Ring wings, *Flutter, Mathematical analysis, Differential equations, Supersonic flow, Aerodynamics.

The possibility of flutter of a supersonic ring wing is investigated by using linearized equations. The elastic system is limited to flexural deformations and piston theory is employed for aerodynamic pressures. By means of Lagrange's equations, the equations of motion are derived, and expressions for critical Mach number and flutter frequency obtained. Results are restricted to wings of moderately high aspect ratio by the simplified aerodynamics. A representative airfoil cross-section is chosen and flutter quantities calculated for various values of geometric parameters and mode number. Analytical and numerical results indicate that the system investigated is highly stable. (Author)

PB 154 950 $4.60

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
ON THE MOTION OF THIN AIRFOILS IN FLUIDS OF LARGE BUT FINITE ELECTRICAL CONDUCTIVITY, by James E. McCune. Rept. on Contract AF 18(600)1523. Jan 59, 45p. 8 refs. AFOSR-TN-59-456; AD-215 030.

DESCRIPTORS: *Airfoils, Motion, Fluids, Conductivity, Electrical conductance, Magnetic fields, Fluid flow, Perturbation theory, *Magnetohydrodynamics.

A 2-dimensional, small-perturbation theory for the steady motion of thin lifting airfoils in an incompressible conducting fluid, with the uniform applied magnetic field perpendicular to (and in the plane of) the undisturbed, uniform flow field, is described. The conductivity of the fluid is assumed to be such that the magnetic Reynolds number ($\equiv R_m$) of the flow is large but finite. Within this assumption, a theory based on superposition of sinusoidal modes is constructed and applied to some simple thin airfoil problems. It is shown that with this particular field geometry the Alfven wave mechanism is important in making possible very deep penetration into the flow field of currents and their associated vorticity. It is also shown that the current penetration for an airfoil is much larger than for a wavy wall of wave length equal to the airfoil chord. A value of $R_m = 5$ is found to be a good approximation to infinity; use of the present technique for values of R_m on the order of unity is permissible. These results provide an indication of what is meant by large magnetic Reynolds number in 2-dimensional magneto-aerodynamics. (Author)

PB 154 552 $2.60

David Taylor Model Basin, Washington, D. C.
LAMINAR SEPARATION OF FLOW AROUND SYMMETRICAL STRUTS AT VARIOUS ANGLES OF ATTACK, by P. K. Chang and W. H. Dunham. Jan 61, 25p. 14 refs. Rept. 1365; AD-251 022.

DESCRIPTORS: Fluid flow, *Laminar boundary layer, Fluid mechanics, *Cylindrical bodies, Aerodynamic configurations, Aerodynamics, Hydrodynamics, Test methods.

Laminar separation was determined by the dust method on two symmetrical strut sections with thickness ratios of 50 percent and 9.42 percent. The method consists of dispersing fine dust into the flow near the rear of the strut which had been coated with an oil film. The dust adheres to the strut in the separated regions. If the flow is laminar up to the point of separation, the separated region is clearly delineated. Laminar flow separation points were measured on geometrically similar models within the two groups of struts to determine the effect of Reynolds number and angle of attack. It was determined that the ratio of the distance of separation from the leading edge to the chord length is independent of Reynolds number. As the angle of attack increased, separation shifted forward on the upper surface and aft on the lower surface. On the group of thin struts separation moved to the leading edge on the upper surface at very small positive angles of attack and measurements were confined to the lower surface. The points of laminar separation computed by the analytical methods of Stratford, Shvets, and Thwaites agreed favorably with the experimental values. The dust method provides a rapid and accurate experimental technique for locating the region of laminar separation. (Author)

PB 153 176 $4.60

Davidson Lab., Stevens Inst. of Tech., Hoboken, N. J.
EXPERIMENTAL STUDIES OF THE ROLL BEHAVIOR OF CRUCIFORM FINS, by Paul Kaplan. Rept. on Contract Nord-16193. Nov 60, 45p. 14 refs. Rept. no. 780; AD-246 640.

DESCRIPTORS: *Fins, Cruciform wings, *Roll, *Rockets, *Guided missiles, Aerodynamics, Control surfaces, Tests, Motion, Model tests.

The results of an experimental study to determine the free rolling characteristics of a cruciform fin configuration are presented. Oscillograph records of the time history of the rolling motions were taken, from which the average steady-state roll angular velocity variation with angle of attack was obtained. An attempt to extract information on the roll moments causing the observed motion by means of graphical differentiation of the motion records did not yield sufficiently accurate data. Limited qualitative information was obtained, which pointed out the need for direct measurement of roll moments under controlled independent variation of test variables. A discussion of the various flow phenomena present under dynamic conditions is given, and means of theoretical analysis for predicting the effect of these mechanisms on the rolling motion are outlined. A recommended program of direct experimental measurement of roll moments is presented as the most effective means of obtaining an understanding of the mechanics underlying the roll phenomena. (Author)

PB 152 459 $8.60

Douglas Aircraft Co., Inc., Santa Monica, Calif.
NORMAL SHOCK WAVES IN AIR WITH CHEMICAL AND VIBRATIONAL RELAXATION EFFECTS. MODEL, GENERAL, by R. A. Batchelder. July 60, 98p. 23 refs. Rept. no. SM-37627; AD-244 671.

DESCRIPTORS: *Shock waves, Air, Chemical reactions, Vibration, Physical properties, *Re-entry aerodynamics, Hypersonics, Blunt bodies, *Heat of formation.

A method is given for including the effects of vibrational and chemical relaxation on the properties aft of normal shock fronts. Complete results are given for six cases using air, in which O_2 dissociation, O_2 vibration, and N_2 vibration are allowed to relax simultaneously toward equilibrium, including dissociation-vibration interaction. The cases presented bound approximately a triangle in altitude-velocity coordinates with vertices at 8000 fps, 100,000 ft. 14,000 fps, 250,000 ft; and 14,000 fps, 150,000 ft. This triangle represents approximately those flight regimes (below 14,000 fps flight velocity) in which significant relaxation effects are predicted to occur behind normal shocks in air. Above this triangle, reactions tend to be essentially frozen, while below it complete equilibrium tends to be established quickly. Numerous equations are presented which may enable the reader to set up similar programs for machine calculation. Some numerical pitfalls are pointed out. The role of the normal shock wave as an indicator of the presence of relaxation effects around blunt bodies is discussed. Evidence is given to support the conclusion that significant relaxation effects occur in blunt body flow fields under flight conditions well inside the flight regimes in which a normal shock produces complete equilibrium quickly. (Author)

PB 153 471 $2.60

Heat Transfer Lab., U. of Minnesota, Minneapolis.
SOME MEASUREMENTS OF A WAKE-BOUNDARY LAYER INTERACTION, by R. Eichhorn and T. L. Eddy. Rept. on Aerodynamic Flow Fields, Contract AF 33(616)5528. Dec 60, 21p. 9 refs. ARL Technical note 60-159; AD-252 806.

DESCRIPTORS: Fluid flow, *Boundary layer, *Wake, Measurement, Vortices, Surfaces, Geometry, Pressure, Velocity.

When a strut or other object is attached to a surface along which a fluid flows, the strut disturbs the boundary layer flow and the wake region of the strut interacts with the boundary layer along the surface giving rise to complicated three dimensional effects. In the present paper these effects were investigated for a geometry consisting of a 2 inch diameter cylinder in uniform axial flow to which was attached normally a 3/16 in. diameter dowel forming a strut. The measurements reported include both static and total pressure surveys in the wake-boundary layer region behind the strut. The resulting wake velocity profiles far from the interaction region behave normally but those within this region do not. The existence of vortices is in some cases clearly seen. (Author)

PB 155 166 $1.60

Iowa State [U. of Science and Tech.] Ames.
MIXED BOUNDARY VALUE PROBLEMS IN ELASTICITY, by H. J. Weiss. Final technical rept. on Contract DA 11-022-ORD-2195. Nov 58, 12p. OOR Proj. 1627; AD-207 009.

DESCRIPTORS: *Elasticity, Mathematical analysis, *Conical bodies, Stresses, Cylinders.

An attempt was made to solve the following 2 problems for a homogeneous, isotropic, elastic material: (1) to find the stresses and displacements in an infinite cylinder subjected to a finite band of displacement on its lateral surface, the remainder of the surface being stress-free; and (2) to find the stresses in an infinite elastic cone subjected to a finite nose of displacement on its lateral surface, the remainder of the surface being stress-free. (Author)

PB 154 581 $3.60

James Forrestal Research Center, Princeton, N. J.
MACH AND REYNOLDS NUMBER EFFECTS ON THE FLOWS OVER BLUNT FLAT PLATES AT HYPERSONIC SPEEDS, by I. E. Vas and S. M. Bogdonoff. Rept. on Research on Boundary Layer Characteristics in the Presence of Pressure Gradients at Hypersonic Speeds, Contract AF 33(616)5416. Nov 60, 35p. 9 refs. Rept. 529; ARL Technical note 60-164; AD-251 919.

DESCRIPTORS: *Bodies of revolution, *Blunt bodies, *Hypersonics, Mach number, Reynolds number, Mathematical analysis, *Hypersonic flow, Pressure, *Sheets.

A series of studies were carried out on a blunt unswept wing covering a Mach number range from 7 to 18 and leading edge Reynolds numbers from about 3,000 to 20,000. This work, together with other published results, cover a total Mach number range from 7 to 24. The results obtained were compared to the simple summation of the calculated theoretical inviscid and viscous effects. The slope of the experimentally determined pressure distribution over the plate agreed quite well with that predicted by the theoretical calculations. The viscous theory alone reasonably predicted the variation in the pressure distribution due to changes in leading edge Reynolds number. The theoretical calculation gave very good correlations at low Mach numbers.

PB 149 796 $5.60

Michigan U. Coll. of Engineering, Ann Arbor.
DESIGN CONSIDERATIONS FOR ARC HEATED HYPERSONIC TUNNEL, by P. M. Sherman, H. C. Early, and W. N. Lawrence. Final rept. on Contract Nonr-1224(31). July 60, 53p. 11 refs. 02953-1F; AD-240 708.

DESCRIPTORS: *Hypersonic wind tunnels, Design, Electric arcs, Heating, *Power supplies, *Test facilities.

A general description, operating conditions, and facility components of a proposed arc-heated hypersonic tunnel are discussed. The initial design and construction considerations are stated in terms of a facility which (1) is quasi-steady, (2) possesses a great deal of energy, and (3) is capable of obtaining high stagnation temperatures at comparatively high pressures for relatively long run times. High pressures are stressed because the extent of the chemical non-equilibrium in the nozzle expansion is sensitive to pressure (for a given temperature). The tunnel installation consists of a small motor coupled to a dc generator with a heavy flywheel, a coil, arc chamber, nozzle, test section, vacuum tank and vacuum pumps. The general operation is the same as for any blow-down tunnel.

Hydrodynamics, Hydraulics, and Hydrostatics

PB 171 671-1-1 $0.25

Diamond Ordnance Fuze Labs., Washington, D. C.
FLUID AMPLIFIER HANDBOOK. SECTION I: GENERAL PRINCIPLES; CHAPTER I: INTRODUCTION, by R. E. Bowles, B. M. Horton, and R. W. Warren. 31 Dec 60, 12p.

DESCRIPTORS: *Fluid flow, *Fluids, Control systems, Design, *Amplifiers, Handbooks, Temperature, *Servo amplifiers, Fluid mechanics.

This handbook concentrates on Fluid Computation and Control Systems which have no moving parts. The fluids considered include incompressible fluids, compressible fluids, and combinations thereof. The range of operating conditions covered includes: temperatures between -100°F and +7000°F, pressure drop across a single component of between 10^{-4} psi and 10^{4} psi, frequencies from zero to one hundred kilocycles per second, and both one shot and continuous duty operation. Systems are included in which the output is either a display of computation results or is a servo action.

PB 171 671-2-7 $0.25

Diamond Ordnance Fuze Labs., Washington, D. C.
FLUID AMPLIFIER HANDBOOK. SECTION 2: DESIGN OF COMPONENTS; CHAPTER VII: TYPE II (BOUNDARY LAYER), by [R. E. Bowles, B. M. Horton, and R. W. Warren. 31 Dec 60] 4p.

DESCRIPTORS: *Boundary layer control systems, Design, *Electronic equipment, *Fluid flow, *Fluids, *Amplifiers, *Servo amplifiers, Control systems, Handbooks, *Servo amplifiers, Fluid mechanics.

See also PB 171 671-1-1

PB 150 625 $13.50

Institute of Engineering Research, U. of California, Berkeley.
PRESSURE DISTRIBUTIONS, ADDED-MASS, AND DAMPING COEFFICIENTS FOR CYLINDERS OSCILLATING IN A FREE SURFACE, by William R. Porter. Rept. on Contract Nonr-222(30). July 60, 192p. 28 refs. Series no. 82, issue no. 16; AD-242 864.

DESCRIPTORS: *Pressure, Theory, *Cylindrical bodies, Surfaces, Surface properties, Hydrodynamics, Fluids, Measurement, Oscillation.

A linearized theory is developed for the pressure distributions, added-mass and damping coefficients for horizontal cylinders oscillating vertically with small amplitude while semi-immersed in the free surface of a fluid of uniform depth. The results of sample calculations made by digital computer are presented. The calculations of the pressure distribution and the total vertical force for the case of a circular cylinder in fluid of infinite depth are compared with values measured in an experiment. The problem is formulated as a linearized boundary-value problem in the theory of infinitesimal surface waves. A velocity potential is synthesized from appropriate functions. The boundary conditions on the free surface and on the bottom and that the surface takes the form of outgoing waves far from the body are satisfied exactly. The boundary condition on the surface of the cylinder is satisfied at the rest position of the cylinder by an expansion in non-orthogonal functions. Convergence in the general case is assumed. The expansion coefficients for the case of a circular cylinder in fluid of infinite depth were calculated by two different numerical procedures. One of these methods was chosen for further development to provide sample calculations for elliptic and more general cylinders of approximately ship-like cross-sections. (Author)

PB 152 601 $1.60

Applied Research Lab., Crucible Steel Co. of America, Syracuse, N. Y.
DEVELOPMENT OF A DUCTILE, OXIDATION-RESISTANT AND HIGH STRENGTH SINGLE-PHASE (AUSTENITIC) ALLOY BASED ON Fe-Al-Mn-C SYSTEM, by R. C. Gibson. Bimonthly progress rept. no. 4, 15 Apr-15 June 60, on Contract NOas 60-6025-c. [1960] 16p; AD-244 162.

DESCRIPTORS: Heat resistant alloys, *Austenite, Iron alloys, Manganese alloys, Aluminum alloys, Carbon alloys, Heat treatment, Aging, Hardness, Mechanical properties, Oxidation, Temperature, Additives.

A study was made of the effect of W and Mo on the properties of an Fe-Al-Mn-C-Ni-V base alloy. Solution treatments were performed at 1800°, 1900°, and 2000°F followed by oil quenching. After aging for 16 hr in a gradient furnace (1000° to 1500°F), hardness measurements were made on heat treated specimens at locations corresponding to 1100°, 1200°, 1300°, and 1400°F. The data indicated that individual additions of up to 1.6% Mo and 1.17% W to the base alloy did not significantly affect the age hardening characteristics of the solution treated alloys. Alloys containing both Mo and W age hardened to slightly higher hardnesses than alloys containing either Mo or W. All the alloys attained peak hardness at the 1200°F aging temperature when they were solution treated at 1800° and 1900°F. At 2000°F solution temperature, the alloys achieved peak hardness after aging at 1300°F. A significant increase in rupture life was obtained in the alloys containing 1.66% Mo and 1.17% W, oil quenched from 1900°F and aged for 16 hr at 1200°F. Combination of Mo and W did not significantly improve rupture life.

NAA-SR-5893 $0.75

Atomics International, Canoga Park, Calif.
DIFFUSION OF BERYLLIUM IN BERYLLIUM OXIDE PART II., by S. B. Austerman. Rept. on Contract AT(11-1)-GEN-8. 1 May 61, 38p.

BMI-1513 $0.75

Battelle Memorial Inst., Columbus, Ohio.
HIGH-TEMPERATURE NIOBIUM-BASE ALLOYS FOR SODIUM-COOLED REACTORS, by J. A. DeMastry, F. R. Shober, and R. F. Dickerson. Rept. on Contract W-7405-eng-92. 14 Apr 61, 29p.

WAPD-239 $1.00

Bettis Atomic Power Lab., Pittsburgh, Pa.
SOME OBSERVATIONS ON THE CAUSES AND PREVENTION OF EXAGGERATED GRAIN GROWTH IN ZIRCALOY-CLAD PRESSURE-BONDED OXIDE PLATE FUEL ELEMENTS, by D. Jaffe. Rept. on Contract AT-11-1-GEN-14. Feb 61, 35p.

PB 149 453 $1.60

Brown U. Div. of Engineering, Providence, R. I.
COMPOSITE ALLOYS BY POWDER METALLURGY METHODS, by D. E. Gücer and J. Gurland. Technical rept. no. 6 (Final) on Contract Nonr-562(19). June 60, 19p. 1 ref. Nonr-562(19)/16; AD-240 388.

DESCRIPTORS: *Powder alloys, *Powder metallurgy, *Silver alloys, Mechanical properties, Deformation, Tungsten alloys, Molybdenum alloys, Nickel alloys, Tungsten compounds, Carbides, Elasticity, Sintered alloys, Sintering.

The deformation in bending of four composite, silver-base alloys was investigated on samples with, respectively, 15% of tungsten, molybdenum, tungsten carbide, or nickel. It was found that the overall plastic behavior of these particle strengthened alloys is unaffected by the nature of the second phase particles if the latter remain elastic. It was also attempted to produce composite bodies from non-wetting components by components by compacting of soft metal powders together with hard particles under very high pressures to produce cold welding and subsequent sintering to improve existing bonds. Factors investigated were compacting pressure, sintering temperature and repeated pressing-sintering cycles and their effects on density. (Author)

PB 161 248 $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
ELECTROPOLISHING AND CHEMICAL POLISHING OF HIGH-STRENGTH, HIGH-TEMPERATURE METALS AND ALLOYS, by J. A. Gurklis, L. D. McGraw, and C. L. Faust. [Rept. on Contract AF 33(616)7747]. 12 Apr 61, 15p. 30 refs. DMIC memo. 98; AD-254 767.

DESCRIPTORS: *Metals, *Alloys, *Electrolytic polishing, Refractory materials.

Physical cleanliness is provided by degreasing in solvent (or vapor), and by soaking or treating electrolytically in aqueous alkaline solutions. Chemical cleanliness is provided by pickling, alkaline descaling, vapor blasting, abrasive blasting, etc. Mechanical cleanliness is provided by electropolishing or chemical polishing. The discussion shows the types of solutions that can be used and gives some formulations and procedures for using them.

PB 161 241 $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
THE EMITTANCE OF TITANIUM AND TITANIUM ALLOYS, by W. D. Wood, H. W. Deem, and C. F. Lucks. [Rept. on Contract AF 33(616)7747] 17 Mar 61, 27p. 14 refs. DMIC memo. 91; AD-253 755.

DESCRIPTORS: *Titanium, *Titanium alloys, Thermal radiation, Spectrographic analysis, Tests.

This memorandum is a compilation of original test data on emittance and reflectance of titanium and

titanium alloys. No absorptance or transmittance data were found. The data were taken from the literature published during the period 1940-1959 inclusive, and as much of the 1960 literature as could be obtained. The following sources were searched: Chemical Abstracts, Ceramic Abstracts, Metallurgical Abstracts, Nuclear Science Abstracts, and the files of the Defense Metals Information Center (DMIC). The authors have attempted to evaluate these sources of data according to the apparent thoroughness of methods and techniques as described by the various investigators. In many cases the descriptions in the literature are a summary of methods and results and a complete evaluation is impossible. With these considerations in mind the authors have shown curves which, in their estimation, indicate the most probable values for the various conditions and materials. (Author)

PB 161 244 $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE EVALUATION OF SPECIAL METAL PROPERTIES, by J. E. Campbell. [Rept. on Contract AF 33(616)7747]. 28 Mar 61, 7p. 6 refs. DMIC memo. 94; AD-253 424.

DESCRIPTORS: *Low temperature alloys, Steel, Low temperature research, Stainless steel, Fracture (Mechanics), Mechanical properties, Titanium alloys, Sheets, *Alloys

Tensile properties at -423 F are tabulated for a number of alloys. Additional data on the properties of types 301 and 304 L stainless steel sheet cold reduced 20 to 70% are given for test temperatures of 75, -320, and -423 F. Various phases of the fracture-toughness type specimen for high-strength steel and Ti alloy sheets are being investigated. The presence of a grain-boundary film was reported when type H-11 steel was air quenched. The effects of variations in the composition on the properties of type H-11 were studied.

PB 161 247 $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE TECHNOLOGY OF COLUMBIUM AND TANTALUM, by E. S. Bartlett and F. F. Schmidt. Rept. for Jan-Mar 61 [on Contract AF 33(616)7747]. 10 Apr 61, 6p. 11 refs. DMIC memo. 97; AD-254 416.

DESCRIPTORS: *Niobium, *Tantalum, Alloys, Processing, Heat treatment, Manufacturing methods, Mechanical properties.

This memorandum briefly reviews major developments in the technology of columbium and tantalum, and their alloys, during the period from January through March, 1961.

PB 161 246 $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE TECHNOLOGY OF MOLYBDENUM AND MOLYBDENUM-BASE ALLOYS, by J. A. Houck. [Rept. on Contract AF 33(616)7747]. 7 Apr 61, 4p. 8 refs. DMIC memo. 96; AD-253 757.

DESCRIPTORS: *Molybdenum, *Molybdenum alloys, Production, Powder metallurgy, Properties.

The information presented was obtained from published literature made available to the Defense Metals Information Center during the past three or four months.

PB 161 243 $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
A REVIEW OF RECENT DEVELOPMENTS IN TITANIUM AND TITANIUM-ALLOY TECHNOLOGY, by R. A. Wood. [Rept. on Contract AF 33(616)7747]. 27 Mar 61, 6p. 15 refs. DMIC memo. 93; AD-253 178.

DESCRIPTORS: *Titanium alloys, *Titanium, Production, Industrial production, Sheets, Ignition, Corrosion, Mechanical properties, Hydrogen embrittlement, Titanium wire, Wire, Oxygen.

A 10% increase is anticipated in the production of Ti mill products during 1961. Recent studies on the spontaneous ignition of Ti showed that ignition would occur in gaseous O when sheet Ti with a surface-to-volume ratio of 67 to 1 was suddenly exposed to pressurized gas. Salt corrosion studies indicated a correlation between processing and the mode of crack propagation in both aqueous and dry-salt tests. Ni plating should offer good protection from salt corrosion if porosity in the coating is eliminated. Contradictory results were reported on the embrittling effect of H. Progress is reported on the production of Ti-7Al-12Zr and Ti-5Al-5Sn-5Zr compositions for high-temperature applications, the production of Ti alloy wire, in the welding of heavy plate (2-in. thick), the deep drawing of helmet shells, and in the substitution of Ti alloy for steel in rocket motor cases.

PB 161 240 $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
A REVIEW OF THE EFFECTS OF STARTING MATERIAL ON THE PROCESSING AND PROPERTIES OF TUNGSTEN, MOLYBDENUM, COLUMBIUM AND TANTALUM, by B. C. Allen. [Rept. on Contract AF 33(616)7747]. 13 Mar 61, 40p. 41 refs. DMIC memo 90; AD-253 387.

DESCRIPTORS: *Tungsten, *Molybdenum alloys, *Niobium, *Tantalum, *Powder metallurgy, Processing, Purification, Impurities, Ores, Refractory materials, Heat resistant alloys, Physical properties, Reduction, Powder alloys.

This memorandum summarizes recent information relating characteristics of the as-reduced refractory metal powders to the properties of the consolidated or fabricated product. The history of the powder determines the purity and particle size which in turn affect composition, sintering characteristics, and final purity. The latter can then affect the recrystallization temperature, grain size, strength, and ductility of the fabricated piece. Commercial powders of W, Mo, Nb, and Ta are generally produced in high purity (99.9+, 99.9+, 99.5+, 99.5+ percent, respectively) with particle sizes ranging from 0.1 to about 350 microns. The major impurities in these metals and their alloys are interstitials (C, O, N, and H), which make up about half the total impurity content. These impurities are largely removed by consolidation via powder metallurgy, arc melting, or electron-beam refining, with the latter being the most effective. (Author)

PB 161 245 $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
STRENGTHENING MECHANISMS IN NICKEL-BASE HIGH-TEMPERATURE ALLOYS, by C. H. Lund and D. C. Drennen. [Rept. on Contract AF 33(616)7747]. 4 Apr 61, 19p. 14 refs. DMIC memo. 95; AD-253 756.

DESCRIPTORS: *Nickel alloys, Hardening, Failure (Mechanics), Heat treatment, *Heat resistant alloys, Boron, Zirconium, Metallurgy.

This memorandum reviews the various mechanisms from which these materials derive their high-temperature strength. The strengthening mechanisms discussed are (1) solid-solution hardening, (2) precipitation hardening, and (3) strengthening imparted by additions of boron and zirconium. Each of these strengthening mechanisms are discussed briefly in terms of dislocation theory. A discussion of failure is included also, because, in some instances, alloys fail prematurely, i.e., before their idealized strengths can be realized. The final section is a discussion of heat treatment and related grain-boundary behavior. (Author)

PB 161 238 $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
ZINC COATINGS FOR PROTECTION OF COLUMBIUM FROM OXIDATION AT ELEVATED TEMPERATURES, by W. D. Klopp and C. A. Krier. [Rept. on Contract AF 33(616)7747]. 3 Mar 61, 20p. 8 refs. DMIC memo. 88; AD-253 179.

DESCRIPTORS: *Zinc coatings, *Niobium, Metal coatings, Coatings, Oxidation, Vapor plating, Oxidation inhibitors, Electroplating, Vacuum furnaces, Melting, Processing, Intermetallic compounds, High temperature research, Temperature.

Zn coatings may be applied to Nb by vacuum distillation at 1450 F, hot dipping at 1000 to 1300 F, aqueous electroplating, or cladding. A conditioning treatment consisting of about 16 hours at 1600 F in air is required to obtain maximum protection at higher temperatures. The service life of a properly conditioned 6-mil coating is about 1000 hours at 1800 F and 70 hours at 2000 F. The Nb-Zn intermetallics, which form during application and conditioning of the coating, decompose between 1892 and 2048 F. Zn coatings exhibit remarkable self-repair properties and reduce or eliminate contamination hardening of the Nb substrate. The ability to repair relatively large defects is associated with the high Zn vapor pressure over the intermetallics. Zn vapor oxidizes to ZnO over the defect, arresting the Nb-oxidation reaction. The vapor also reforms intermetallic layers under the oxide. Contamination hardening of the substrate is eliminated for 1000 hours at 1800 F by a 10- to 12-mil coating. (Author)

PB 155 191 $4.60

General Mills, Inc., Minneapolis, Minn.
THE REVERSAL OF STRATOSPHERIC WINDS OVER NORTH AMERICA, by Arthur D. Belmont. Final rept. on Contract AF 19(604)6618. 27 Feb 61, 42p. 19 refs. GMI rept. no. 2173; AFCRL-265; AD-252 834.

DESCRIPTORS: *Stratosphere, North America, Direction finding, Meteorological data, Meteorological charts, *Wind.

The individual stratospheric reversal of 1957, 1958 and 1959, and of the normals are summarized and compared. The erratic spring reversal occurs as the winter vortex is displaced from time to time by a warm high pressure cell moving from mid-latitudes to polar latitudes. Occasionally such intrusions prove temporary and the vortex returns to its polar location; at other times a complicated cellular pattern eventually develops into a stable summer polar anticyclone.

Over the western hemisphere it is suggested that easterlies first appear at highest levels near 55 - 60 degrees N in the early spring, then advance downward and northward in time. As the reversal process is not circumpolarly symmetric, southward progression is to be expected in the opposite hemisphere to the northward progression. The fall reversal appears to be far more regular and very rapid, starting in August near 55 degrees N and propagating upward. By mid-September all the stratosphere north of 55 degrees N has usually changed to westerly flow, only 2 - 3 wk after its start. (Author) (See also PB 154 376)

PB 154 946 $1.10

Illinois U., Urbana.
RESEARCH ON ANELASTIC BEHAVIOR OF CERTAIN BINARY COMPOUNDS, by Charles Wert. Final technical rept. for 3 Oct 51-31 May 58 on Contract DA 11-022-ORD-1731, Continuation of Contract DA 11-022-ORD-535. 17 June 58, 10p. OOR Proj. 157; AD-202 149.

DESCRIPTORS: *Alloys, Temperature, Mechanical properties, Internal friction.

A number of quantitative determinations of alloying behavior were made on systems where internal friction effects were already known qualitatively. This type of investigation should continue in part. Several probing type of measurements were made on alloy systems where qualitative behavior was desired. Some of these

measurements were quite successful. Several phenomena which were uncovered are being intensively studied here in detail, some others have been taken up elsewhere. (Author)

PB 171 110 $2.50

Office of Naval Research, Washington, D. C.
METALLURGY IN THE NAVY. PROCEEDINGS [OF THE] AIME-NAVY DAY FORUM, FEBRUARY 15, 1960, NEW YORK CITY. [1960] 114p. 12 refs. ONR-8.

DESCRIPTORS: *Naval research, Conferences, Naval procurement, *Industrial research, *Metallurgy, *Materials, *Scientific research, *Alloys, *Metals.

Contents:
Metallurgical materials problems associated with deep-diving submarines
Materials requirements of hypersonic flight vehicles
Direct energy conversion
Navy research in materials
The navy research and development program in metallurgy
The navy refractory metal program
Semiconductor research in the Navy
Brittle fracture
Irradiation effects in magnetic materials
Thermoelectric materials

DP-527 $2.25

Savannah River Lab., Aiken, S. C.
MECHANICAL PROPERTIES OF IRRADIATED ZIRCONIUM, ZIRCALOY, AND ALUMINUM. A summary of the data in the literature, by R. E. Schreiber. Rept. on Contract AT(07-2)-1. Jan 61, 108p.

Ferrous Metals

PB 161 250 $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
REVIEW OF CURRENT DEVELOPMENTS IN THE METALLURGY OF HIGH-STRENGTH STEELS, by H. J. Hucek and A. R. Elsea. Rept. for 1 Jan-31 Mar 61 [on Contract AF 33(616)7747]. 20 Apr 61, 3p. 4 refs. DMIC memo. 100; AD-254 768.

DESCRIPTORS: *Stainless steel, Steel, Metallurgy, Alloys, Metals.

PB 161 249 $0.50

Defense Metals Information Center, Battelle Memorial Inst., Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE TECHNOLOGY OF HIGH-STRENGTH STAINLESS STEELS, by D. A. Roberts. Rept. for 1 Jan-31 Mar 61 [on Contract AF 33(616)7747]. 14 Apr 61, 3p. 3 refs. DMIC memo. 99.

DESCRIPTORS: *Stainless steel, Steel, Alloys, Metals.

Research and development in the field of high-strength stainless steels appears to be directed along two principal paths: (1) the development of alloys with improved strength properties and (2) the accumulation of information on the properties and physical metallurgy of existing alloys so that they may be used more effectively. By and large, the development of new alloys is being carried out by the stainless-steel producers, while the accumulation of property data for the most part is being undertaken on Government contracts. (Author)

Light Metals

ANL-6230 $0.50

Argonne National Lab., Ill.
FILM GROWTH ON ALUMINUM IN HIGH-TEMPERATURE WATER, by R. K. Hart and W. E. Ruther. Rept. on Contract W-31-109-eng-38. Apr 61, 25p.

PB 154 916 $4.60

Poulter Labs., Stanford Research Inst., Menlo Park, Calif.
SHOCK WAVE COMPRESSION OF HARDENED AND ANNEALED 2024 ALUMINUM, by G. R. Fowles. Rept. on Contract AF 49(638)625. 25 Oct 60, 43p. 23 refs. [Technical rept. no. 011-60] SRI Proj. GU-2912; AFOSR-117; AD-249 875.

DESCRIPTORS: *Aluminum alloys, Elasticity, Shock waves, Compression shock, Hardness, Pressure, Plasticity, Compressible flow.

Measurements of the Hugoniot equations of state of hardened and annealed 2024 aluminum at pressures below 50 kilobars are presented. Oblique shock geometry was employed. It is concluded that elastic-plastic theory is valid for the description of plane shock waves in this material.

Structural Metallurgy and Corrosion

ANL-6206 $0.50

Argonne National Lab., Ill.
CORROSION OF SOME REACTOR MATERIALS IN DILUTE PHOSPHORIC ACID, by J. E. Draley, S. Greenberg, and W. E. Ruther. Rept. on Contract W-31-109-eng-38. Apr 61, 20p.

PB 152 043 $2.60

Armour Research Foundation, Chicago, Ill.
A MECHANISM FOR STRESS-CORROSION EMBRITTLEMENT, by Rodney P. Elliott and Robert H. Read. Summary rept. 1 Aug 59-31 July 60 on Contract Nonr-2602(00). 14 Sep 60, 24p. 9 refs. Rept. ARF 2152-13; AD-243 455.

DESCRIPTORS: Aluminum alloys, Copper alloys, Iron alloys, *Fracture (Mechanics), Surface properties, *Corrosion, Stresses, Mechanical properties, Metals, Alloys, Energy, Metallurgy, Tensile properties.

In order to bring the phenomenon of stress-corrosion cracking within the general framework of brittle fracture, the stress level for crack formation as a function of grain size has been investigated for a number of alloys. Stress-corrosion embrittlement of Al-4Cu in $NaCl-H_2O_2$ solution at room temperature and Armco iron in boiling $Ca(NO_3)_2-NH_4NO_3$ solution have been investigated. The stress for crack formation as a function of grain diameter for these alloys can be rectified in accordance with the Petch equation. From the slopes of data, surface energies of 160 and 32 ergs/cm^2 were calculated, respectively, for the Al-Cu alloy and Armco iron. These values of surface energy represent appreciable reduction from surface energy in a non-stress corroding medium and hence support the hypothesis that stress corrosion is indeed a brittle fracture phenomenon. (Author) (See also PB 153 167)

PB 171 537 $0.50

Coating and Chemical Lab., Aberdeen Proving Ground, Md.
STORAGE OF ETHYLENE GLYCOL WITH VARIOUS INHIBITORS, by Charles B. Jordan. 14 Mar 61, 11p. 5 refs. Rept. no. CCL #100; AD-254 003L.

DESCRIPTORS: *Storage tanks, Containers, *Fuel storage tanks, *Ethylenes, *Glycols, Corrosion, Deterioration, Metallurgy, *Corrosion inhibition, Coatings, Aluminum coatings, Tin coatings, Metal coatings.

The object of this study is to show the packaging effect of diluted and undiluted ethylene glycol on aluminum and tin coated steel, when used with various inhibitors. Inhibitors involved were borax, a borax-glycol condensate, mercaptobenzothiazole and the sodium salt of mercaptobenzothiazole. The study was conducted at low and high pH's. Aluminum and tin-coated steel panels were partially immersed in solutions contained in test jars at room temperature. Periodic inspections were made of the panels and solutions. In general, dilution of the glycol decreased the corrosion of tin and increased the corrosion of aluminum. Increasing the pH to 10.5 usually increased the corrosion on both metals. The borax/glycol condensate performed better than borax except in the high pH tests with aluminum. The sodium salt of mercaptobenzothiazole was better than mercaptobenzothiazole in most instances. It appears that under specified conditions ethylene glycol can be packaged and stored in either aluminum or tin coated steel when mercaptobenzothiazole or its sodium salt form a part of the inhibitor combination. (Author)

PB 154 164 $1.60

Crucible Steel Co. of America, Syracuse, N. Y.
DEVELOPMENT OF A DUCTILE, OXIDATION-RESISTANT AND HIGH STRENGTH SINGLE-PHASE (AUSTENITIC) ALLOY BASED ON Fe-Al-Mn-C SYSTEM, by R. C. Gibson. Bimonthly progress rept. no. 5, 15 June-15; Aug 60, on Contract NOas 60-6025-c. Sep 60, 14p; AD-244 667.

DESCRIPTORS: *Heat resistant alloys, *Austenite, *Iron alloys, Oxidation, *Silicon, Aging, Temperature, Rupture, Stresses, Tensile properties.

Studies were conducted on an Fe-Al-Mn-C-Ni-W-Mo-V base alloy containing varying amounts of silicon. The data indicate that silicon had a significant effect on the aging characteristics of the alloy in the temperature range 1100 to 1400 F. Silicon improved oxidation resistance two to three-fold. Stress-rupture tests disclosed that the optimum silicon content is about .50%. (Author) (See also PB 148 785)

APEX-586 $1.00

General Electric Co., Cincinnati, Ohio.
PROPERTIES OF LITHIUM HYDRIDE II, LITHIUM HYDRIDE CORROSION STUDIES: 19-9DL ALLOY, by F. H. Welch. Rept. on Contracts AF 33(600)-38062 and AT(11-1)-171. 10 Apr 61, 41p.

HW-59778(Rev.) $0.50

Hanford Atomic Products Operation, Richland, Wash.
SUMMARY REPORT ON THE CORROSION OF ALUMINUM IN HIGH TEMPERATURE DYNAMIC WATER SYSTEMS, by R. J. Lobsinger. Rept. on Contract AT(45-1)-1350. 1 Feb 61, 17p.

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

PB 153 817 $6.60

Illinois U., Urbana.
RESEARCH IN NUCLEAR PHYSICS. Technical rept. no. 14, 1 Nov 59-29 Feb 60, on Contract Nonr-1834(05). Mar 60, 63p. 33 refs. AD-233 133.

DESCRIPTORS: *Nuclear physics, Particles, Transistors, Semiconductors, Alpha particles, Resonance, Detection, Scientific reports.

Included in the report are preprints of:
Collective motion in many particle systems. Part I. The violation of conservation laws, by Harry J. Lipkin
Resonance reactions with generalized one level approximation, by Harry Lustig
Detection of alpha particles with commercially available transistors, by Avivi I. Yavin.

PB 154 901 $1.60

Kansas U., Lawrence.
THE REACTIONS OF RECOIL TRITIUM ATOMS IN AQUEOUS SOLUTION, by T. Kambara, R. Milford White and F. S. Rowland. Progress rept. on Reactions of Radioactive Atoms with Atmospheric Components, Contract AF 19(604)4053. 22 Feb 61, 18p. 22 refs. AD-251 657.

DESCRIPTORS: *Tritium, Hydrogen, *Isotopes, Hydrogen compounds, Hydrides, Hydroxides, Lithium compounds, Exchange reactions, Solvent action, Water, Thermochemistry, *Radiochemistry, *Recoil atom, Solutions, *Radioactive isotopes, Nuclear reactions, Recombination reactions, Atmosphere, Atoms, Chemical reactions.

Tritium atoms recoiling from Li^6(neutron, alpha)H^3 in aqueous solution form HT and HTO in the ratio of 0.10+ or −.01 under most conditions. In concentrated $Ca(NO_3)_2$ solutions, the HT/HTO radio decreases only to 0.023. The most important reaction leading to HT formation is the hot abstraction reaction $T + H_2O$ yields HT + OH. (Author)

PB 153 130 $23.50

Laboratory for Nuclear Science, Mass. Inst. of Tech., Cambridge.
SOME OPTICAL MODEL CALCULATIONS, by E. J. Campbell, H. Feshbach and others. Technical rept. no. 73 on Contracts Nonr-1841(16) and AT(30-1)2098. 8 Feb 60, 495p. AD-236 223.

DESCRIPTORS: *Nuclear models, *Neutron cross sections, Nuclei, Elastic scattering, *Neutron absorption, *Neutron scattering, Nuclear energy levels, Numerical methods and procedures, Tables, Digital computers.

The various numerical results consequent to the fitting of low-energy neutron-nucleus cross sections by a complex potential model are tabulated. In addition to the computed theoretical values of the cross sections and of the angular distributions, the tables give the real and imaginary parts of the cotangent of the phase shift for each value of the orbital angular momentum as well as the partial shape elastic cross section and the partial cross section for the formation of the compound nucleus.

UCRL-6251 $1.25

Lawrence Radiation Lab., U. of California, Livermore.
RADIATION AND TEMPERATURE MEASUREMENTS OF THE NEPTUNE EVENT, by J. D. Peterson and W. P. Bennett. Rept. on Contract W-7405-eng-48. Jan 61, 48p.

UCRL-6319 $0.75

Lawrence Radiation Lab., U. of California, Livermore.
A SLOTTED-CYLINDER VELOCITY SELECTOR FOR NEUTRON RESEARCH, by M. Ruderman and W. C. Dickinson. Rept. on Contract W-7405-eng-48. 15 Feb 61, 34p.

UCRL-9563 $1.50

Lawrence Radiation Lab., U. of California, Berkeley.
TWO PROBLEMS OF STRUCTURE IN THE THEORY OF WEAK INTERACTIONS. PART I: RADIATIVE PION DECAY INTO ELECTRONS. PART II: ELECTROMAGNETIC PROPERTIES OF A CHARGED VECTOR MESON INTERMEDIARY IN WEAK INTERACTIONS, by J. A. Young. Rept. on Contract W-7405-eng-48. 8 Feb 61, 65p.

NAS-NS-3022 $0.75

Michigan U., Ann Arbor.
THE RADIOCHEMISTRY OF VANADIUM, by J. L. Brownlee, Jr. Dec 60, 80p.

NLCO-826 $1.75

National Lead Co. of Ohio, Cincinnati.
SUMMARY TECHNICAL REPORT, 1 JAN 61 - 31 MAR 61. Rept. on Contract AT(30-1)-1156. 5 May 61, 72p.

PB 154 485 $3.60

Naval Radiological Defense Lab., San Francisco, Calif.
THE INFLUENCE OF SOIL COMPOSITION ON THE THERMAL NEUTRON COMPONENT OF LARGE SCALE NEUTRON FIELDS, by F. M. Tomnovec and R. L. Mather. 1 Apr 60, 39p. 12 refs. Research and development technical rept. USNRDL-TR-413; AD-237 912.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Thermal neutrons, Detection, Measurement, *Radioactivation analysis, *Soils.

Fast neutron fields which extend over distances large compared to a mean free path in air (such as cosmic ray fields or nuclear weapon fields) develop an equilibrium low energy neutron spectrum which is different in air than in materials of the earth's surface. Near the earth's surface a transition region occurs. Cyclotron experiments were performed to simulate the changes in this region with a change of soil composition. The changes observed seemed to depend chiefly on the hydrogen content of the soil. The thermal neutron flux at the surface increased approximately 15% for each percent of water content by weight. (Author)

NAS-NS-3029 $1.00

Oak Ridge National Lab., Tenn.
THE RADIOCHEMISTRY OF RUTHENIUM, by E. I. Wyatt and R. R. Rickard. Feb 61, 84p.

PB 154 086 $1.10

Texas U., Austin.
THE INTERACTION OF A TRIPLET AND A NORMAL HELIUM ATOM, by G. H. Brigman (Convair), S. J. Brient, and F. A. Matsen. Technical note no. 1 on Contract AF 49(638)560. 5 Jan 61, 10p. 13 refs. ARPA Order no. 24-59, Task 2; AFOSR-TN-60-954; AD-249 257.

DESCRIPTORS: *Helium, *Atoms, Energy, Electrons, Potential theory, Half life, Atomic orbitals.

The electronic energy of the system He(^{1}S) and He(^{3}S) was calculated as a function of nuclear separation. This calculation differs from an earlier one by R. A. Buckingham and A. Dalgarno (Proc. Roy. Soc. London A213, 327; 1952) in three ways: (1) The use of a nodeless 2s function, (2) The use of an open-configuration wave-function (1s1s') for He(^{1}S), and (3) The use of orbital exponents optimized for each internuclear distance. The energy obtained lies approximately one volt below the earlier calculation but confirms it in all qualitative aspects including the presence of a hump at R = 4a. (Author)

PB 149 323 $1.10

Washington U., Seattle.
SPIN EXCHANGE RESONANCE OF FREE ELECTRONS, by Hans G. Dehmelt. Technical rept. no. 1, 1 June 59-31 May 60, on Polarization Exchange Resonance, Contract Nonr-477(25). [1960] 4p. 3 refs. AD-239 982.

DESCRIPTORS: Photoelectrons, Spin, Resonance, Polarization, *Resonance absorption, Cyclotrons, *Electron capture, *Electrons.

Elementary Particles

PB 154 140 $1.60

Institute of Theoretical Physics, Stanford U., Calif.
PION-NUCLEON SCATTERING IN THE MANDELSTAM REPRESENTATION, by S. C. Frautschi and J. D. Walecka. Technical note no. 18 on Contract AF 49(638)388. Nov 60, 11p. 8 refs. AFOSR TN-60-1436; AD-249 883.

DESCRIPTORS: *Pions, *Nucleons, *Scattering, Theory.

Scattering amplitudes are investigated quantitatively in terms of the fundamental coupling constants of the theory and masses of the particles involved. Given the pion-nucleon coupling constant and a pion-pion interaction, pion-nucleon scattering is investigated. (This is a summary of a paper which has been accepted for publication by the Physical Review.)

PB 154 138 $3.60

Institute of Theoretical Physics, Stanford U., Calif.
RADIATIVE CORRECTIONS TO ELECTRON-PROTON SCATTERING, by Yung-Su Tsai. Technical note no. 31 on Contract AF 49(638)388. Nov 60, 36p. 20 refs. AFOSR TN-60-1366; AD-249 886.

DESCRIPTORS: *Electrons, *Proton scattering, Corrections, Scattering, Mesons, Quantum mechanics, Potential scattering.

The radiative corrections to electron-proton scattering are calculated with the effects of proton taken into account. The assumption is made that the experimental conditions of Hofstadter et al. (Proceedings of the Tenth Annual International Conference on High-Energy Physics at Rochester; Interscience Publishers, New York, 1960) namely only the final electrons are momentum analyzed. The anisotropy in the maximum energy of photons which can be emitted and the radiation from the proton current are the two main effects due to the proton recoil and both effects are considered. The mesonic effects in the two-photon exchange diagrams are not considered. Other than the uncertainty in the mesonic effects, our formula is good up to about 5 Bev. (Author)

Instruments and Installations

TID-7016(Rev. 1) $0.50

Goodyear Atomic Corp., Portsmouth, Ohio.
NUCLEAR SAFETY GUIDE 1961. Rept. on Contract AT(33-2)-1. 42p.

LA-2494 $1.25

Los Alamos Scientific Lab., N. Mex.
PHOTODOSIMETRY PROCEDURES AT LOS ALAMOS, by G. J. Littlejohn. Rept. on Contract W-7405-eng-36. Aug 60, 49p.

Y-1347 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
LEAK RATE VERSUS ABSOLUTE PRESSURE STUDIES COMPLETION REPORT (PROJECT D-P-0131) by J. H. Keith. Rept. on Contract W-7405-eng-26. 16 Jan 61, 12p.

Nuclear Engineering and Power

ANL-6332 $1.50

Argonne National Lab., Ill.
PRELIMINARY DESIGN OF A BASIC RADIATION EFFECTS REACTOR (BRER), by D. R. MacFarlane, R. R. Rohde and others. Rept. on Contract W-31-109-eng-38. Mar 61, 61p.

TID-8210 $0.75

Atomic Energy Commission. Div. of Reactor Development, Washington, D. C.
CURRENT OUTSTANDING REACTOR PHYSICS PROBLEMS. A rept. by U. S. Atomic Energy Commission Advisory Committee on Reactor Physics. May 61, 30p.

NAA-SR-4537 $0.50

Atomics International, Canoga Park, Calif.
DEVELOPMENT OF A RAPID-OPERATING PLUGGING METER, by K. Davis. Rept. on Contract AT(11-1)-GEN-8. 17p.

NAA-SR-5584 $1.00

Atomics International, Canoga Park, Calif.
HALLAM CRITICAL EXPERIMENT, by R. J. Doyas. Rept. on Contract AT(11-1)-GEN-8. 1 May 61, 38p.

WAPD-BT-22 $2.00

Bettis Atomic Power Lab., Pittsburgh, Pa.
BETTIS TECHNICAL REVIEW. REACTOR TECHNOLOGY. Rept. on Contract AT-11-1-GEN-14. Mar 61, 81p.

WAPD-MRP-91 $2.25

Bettis Atomic Power Lab., Pittsburgh, Pa.
PRESSURIZED WATER REACTOR (PWR) Project. Technical progress rept. 24 Feb-23 Apr 61, on Contract AT-11-1-GEN-14. 112p.

TID-7609 $2.50

Chicago Operations Office, Atomic Energy Commission, Ill.
NUCLEAR SUPERHEAT MEETING NO. 3, OCTOBER 13 AND 14, 1960, MILWAUKEE, WISCONSIN, by A. E. Mravca. 10 Nov 60, 133p.

HW-68773 $2.00

Hanford Atomic Products Operation, Richland, Wash.
DR-1 GAS LOOP, by R. E. Baars. Final design rept. on Contract AT(45-1)-1350. Mar 61, 79p.

HW-61236 SUP 2 $1.75

Hanford Atomic Products Operation, Richland, Wash.
PLUTONIUM RECYCLE TEST REACTOR FINAL SAFEGUARDS ANALYSIS. SUPPLEMENT 2. CONSEQUENCES OF A PRIMARY COOLANT LEAK, by N. G. Wittenbrock and J. Muraoka. Rept. on Contract AT(45-1)-1350. 15 Nov 60, 66p.

HW-67395 $1.25

Hanford Atomic Products Operation, Richland, Wash.
PLUTONIUM RECYCLE TEST REACTOR GAS LOOP ANALYSIS, by W. D. Cameron. Rept. on Contract AT(45-1)-1350. Jan 61, 47p.

HW-63072 $0.75

Hanford Atomic Products Operation, Richland, Wash.
TWO-GROUP, SMALL SOURCE THEORY APPLIED TO AN INFINITE ARRAY OF REACTOR SUPERLATTICES, by J. R. Worden. Rept. on Contract AT(45-1)-1350. 25 Oct 60, 32p.

LAMS-2544 $0.50

Los Alamos Scientific Lab., N. Mex.
THE LASL PLASMA THERMO-COUPLE DEVELOPMENT PROGRAM. Quarterly status rept. for period ending 20 Mar 61 on Contract W-7405-eng-36. Apr 61, 15p.

TID-3561 $0.50

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
DIRECT ENERGY CONVERSION DEVICES. A LITERATURE SEARCH, comp. by H. D. Raleigh. Mar 61, 23p.

IDO-16675 $1.25

Phillips Petroleum Co., Idaho Falls.
ORGANIC COOLANT REACTOR PROGRAM. Quarterly rept. 1 Sep-31 Dec 60, on Contract AT(10-1)-205. 28 Mar 61, 51p.

IDO-16668 $2.75

Phillips Petroleum Co., Idaho Falls.
REACTOR PHYSICS STUDIES FOR THE FINAL CONCEPTUAL DESIGN OF THE ADVANCED TEST REACTOR, ed. by R. S. Marsden. Rept. on Contract AT(10-1)-205. 24 Mar 61, 193p.

DP-574 $0.50

Savannah River Lab., Aiken, S. C.
REPROCESSING OF POWER REACTOR FUELS, comp. by F. G. D. Rust. Quarterly progress rept. no. 13, 1 Oct 60-1 Jan 61, on Contract AT(07-2)-1. Apr 61, 14p.

WCAP-1428 $2.00

Westinghouse Electric Corp., Pittsburgh, Pa.
MULTI-REGION REACTOR LATTICE STUDIES, by I. H. Coen. Quarterly progress rept. 1 Oct-31 Dec 60, on Contract AT(30-1)-2176. 30 Jan 61, 76p.

Nuclear Reactions

ANL-5890 $1.75

Argonne National Lab., Ill.
THE ARGONNE 60-IN. SCATTERING CHAMBER, by J. L. Yntema and H. W. Ostrander. Rept. on Contract W-31-109-eng-38. Apr 61, 78p.

ANL-6323 $1.25

Argonne National Lab., Ill.
NEUTRON STRENGTH FUNCTIONS, by P. A. Moldauer. Rept. on Contract W-31-109-eng-38. Mar 61, 53p.

UCRL-8982 $1.00

Lawrence Radiation Lab., U. of California, Berkeley.
DIRECT NUCLEON-NUCLEON COLLISIONS INSIDE THE NUCLEUS ACCORDING TO THE IMPULSE APPROXIMATION, by T. P. Clements and L. Winsberg. Rept. on Contract W-7405-eng-48. 11 Aug 60, 49p.

Radioactivity

PB 155 842 $21.00

Convair, Fort Worth, Tex.
FISSION PRODUCTS FIELD RELEASE TEST. II. Rept. on Contract AF 33(600)38946. Sep 60, 372p. 15 refs. NARF-60-10T; FZK-9-149; AFSWC-TR-60-26; AD-245 602.

DESCRIPTORS: *Nuclear power plants, *Fission products, Hazards, Aircraft, Measurement, Accidents, *Aviation accidents, *Nuclear propulsion, Tests, Test methods, Radiological contamination.

Eleven release experiments were performed in which metallic ANP-type fuel elements were melted in high-temperature induction furnaces to simulate the slow meltdown and release of fission products accompanying a nuclear propulsion system reactor accident. Eight releases were made to the atmosphere under strong meteorological inversion conditions, and the fission products were allowed to disperse onto an instrumented sampling network extending 20 mi downwind from the release point. Three releases were made into collectors designed to collect 100% of the released fission products. The procedures and techniques employed in measuring deposition velocities, release percentages, and long-range diffusion parameters are described. Experimental results are presented, and interpretative comments are made with respect to improvements in the predictability of environmental contamination resulting from a reactor meltdown accident. (Author)
(See also PB 152 806)

PB 154 139 $2.60

Institute of Theoretical Physics, Stanford U., Calif.
EFFECTIVE MOMENTS IN K^{39} AND K^{40}, by A. deShalit. Technical note no. 30 on Contract AF 49(638)388. Nov 60, 28p. 14 refs. AFOSR TN-60-1435; AD-249 885.

DESCRIPTORS: Magnetic moments, Nucleons, *Potassium, Radioactive isotopes.

By comparing magnetic moments of levels belonging to the same nucleon configuration in an odd-odd nucleus, or M1 transitions between such levels, an important information on the effective moments of bound nucleons can be obtained. This analysis is carried out for K^{40} and the results agree very well with the magnetic moment of K^{39}. An attempt is made to include the effects of configuration mixing in K^{40}, induced by the residual proton-neutron interaction. A delta-type interaction which reproduces the spectrum of C^{138} is assumed. The resulting agreement is considerably deteriorated, indicating that such an admixture of configurations is probably negligible in K^{40}. Further experiments are suggested to check the validity of the concept of an effective moment. (Author)

PB 154 137 $1.10

Institute of Theoretical Physics, Stanford U., Calif.
A NOTE CONCERNING THE MAGNETIC MOMENT OF THE MUON, by N. Byers and F. Zachariasen. Technical note no. 27 on Contract AF 49(638)388. Sep 60, 5p. 1 ref. AFOSR TN-60-1305; AD-249 884.

DESCRIPTORS: *Magnetic moments, Particles, *Mesons, Neutrinos.

PB 156 092 $3.60

Naval Radiological Defense Lab., San Francisco, Calif.
FALLOUT FROM HIGH EXPLOSIVE DEVICES CONTAINING U^{238}, by H. K. Chan. Rept. on Effects of Atomic Weapons. 18 Sep 59, 33p. 3 refs. Research and development technical rept. USNRDL-TR-368; AD-232 899.

This report released for sale to the public 1 June 61.

DESCRIPTORS: Uranium, *Radioactive isotopes, Atomic bomb explosions, *Radioactive fall-out, Collecting methods, Airborne, *Spectrographic analysis, X-ray diffraction analysis, Density, *Particles, Alpha particles, Filter papers.

The nature and size of fallout particles produced by the detonation of devices containing high explosives and U^{238} were studied. Analyses showed that U^{238}, Al, Ba and Fe were the major elements present in the four cloud samples studied; the amounts of these elements in each sample were determined. A filter paper oxidation technique and a special washing technique were employed to recover the particles from the cloud samples. Two major types of particles were collected. One type, which comprised 35-50% of the particles, was

black, opaque and spheroidal in shape. The other type was transparent, spherical and either colorless or brown or green in color. Radioautographic studies showed that both types emit alpha tracks; however, the black particles were much more radioactive. Examination of density-separated particle fractions indicate that the black particles were relatively rich in U^{238} while the transparent particles were rich in iron and silica. The density of the fallout particles ranged from less than 3.7 g/cm^3 to beyond 4.2 g/cm^3. (Author)

PHYSICS

ANL-6222 $3.50

Argonne National Lab., Ill.
CHARGED PARTICLE OPTICS OF MAGNETIC SECTOR SPECTROMETERS WITH $H=H_\phi \propto r^{-1}$ (z, r, ϕ CYLINDRICAL COORDINATES WITH THE z-AXIS THE OBJECT-IMAGE LINE), by A. H. Jaffey, C. A. Mallmann, and others. Rept. on Contract W-31-109-eng-38. Nov 60, 271p.

PB 154 204 $6.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
DEPENDENCE OF THE RESONANCE LINEWIDTH OF MICROWAVE FERROMAGNETIC MATERIALS ON INCIDENT RF POWER, by Irving Reingold, Samuel Dixon, Jr., and John L. Carter. Jan 60, 62p. 14 refs. USASRDL Technical rept. 2143; AD-246 021.

DESCRIPTORS: *Ferromagnetic materials, Microwave frequency, *Radiofrequency power, Resonance, Ferrites, Tests, Radio fields, Magnetic fields, Test equipment, Perturbation theory, *Paramagnetic resonance, Test methods, Measurement.

An investigation has been made of the characteristics of ferromagnetic materials when used in the microwave frequency region. These characteristics were determined as a function of incident rf power level and thus rf magnetic field. Ferrite linewidth measurements were made on a number of samples of varying composition. Two methods were used for these measurements (high-Q cavity and cross-guide coupler), and the experimental procedure in each case is described. The results show the linewidth, decrease in magnetic susceptibility, figure of merit, critical field, and the corresponding spin-wave resonance linewidth for each of the materials investigated. The data are presented in a series of curves and tables. The results also indicate the direction that ferromagnetic material research programs may take in order to provide optimum performance of microwave devices that utilize these materials. (Author)

PB 150 884 $2.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
DESIGN OF THIN-WALLED TORISPHERICAL AND TORICONICAL PRESSURE VESSEL HEADS, by R. T. Shield and D. C. Drucker. Technical rept. no. 63 on Contract Nonr-562(10). July 60, 23p. 4 refs. C11-63; AD-242 794.

DESCRIPTORS: *Pressure vessels, Cylindrical bodies, Hydrostatic pressure, Design, Tests, Deformation, Plasticity, *Structural shells, Mathematical analysis.

The failure under hydrostatic test of a large storage vessel designed in accordance with current practice stimulated earlier analytical studies. This paper gives curves and a table useful for the design and analysis of the knuckle region of a thin torispherical or toriconical head of an unfired cylindrical vessel.

PB 154 850 $7.60

[Illinois U., Urbana].
SURFACE STUDIES IN ULTRAHIGH VACUUM BY RADIOTRACER TECHNIQUES, by E. Von Goeler. Rept. on Contract AF 18(603)49. Jan 61, 76p. 69 refs. AFOSR-113; AD-252 022.

DESCRIPTORS: *Surfaces, Surface properties, Vacuum systems, Vacuum apparatus, *Tracer studies.

In recent years a number of novel laboratory techniques relevant to surface research have been developed. Most prominent among them is the production of ultrahigh vacuum that can be maintained for indefinite periods of time. One of the basic surface phenomena is the interaction of single atoms or molecules with the surface. Statistical thermodynamics can be used profitably to establish simple relations between the surface forces, the temperature, and the number of particles being adsorbed to the surface. Detection is facilitated by the use of radioactive isotopes. The method is straightforward and has been repeatedly employed. The results of such experiments are questioned, however, since problems which arise from the necessity for establishing a well defined, uncontaminated surface, have not been solved satisfactorily. An attempt was made to overcome these difficulties and improve the radiotracer method so that it can be considered a respectable tool of clean surface research. (Author)

PB 150 389 $6.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
PROGRESS REPORT NO. 27. Rept. on Contracts Nonr-1841(10), Nonr-1841(50), AF 19(604)6155, AF 19(604)5482, and AF 33(616)5920. July 60, 70p. 41 refs. AD-241 907.

DESCRIPTORS: *Ferroelectric materials, *Ferromagnetic materials, Dipole moments, Magnetic properties, Ceramic materials, *Color centers, Paramagnetic resonance, Single crystals, Dielectrics, Magnetic susceptibility, Crystal structure.

Contents:
Formation and response of electric dipole systems (Ferro- and antiferroelectrics)
Magnetic dipole systems
Magnetic resonance
Optical absorption and color centers
Crystal formation

Crystal-structure analysis
Conduction, field emission, and breakdown
Ions and electric dipoles
Ultrasonic research
Instrumentation.

PB 149 557 $2.60

Marine Physical Lab., Scripps Institution of Oceanography, San Diego, Calif.
MARINE PHYSICAL LABORATORY BIBLIOGRAPHY, JULY 1946-JUNE 1960. Rept. on Contracts Nonr-2216(05), (07), and (10). 27 July 60, 24p. 105 refs. SIO Reference 60-41; AD-240 420.

DESCRIPTORS: *Acoustics, Underwater sound, Sonar, *Underwater sound signals, Acoustic detectors, *Geophysics, Seismic waves, Electromagnetic theory, *Bibliography, Oceanographical data, Physics.

Contents:
Acoustics: underwater; sonar systems
Signal processing
Marine geophysics: seismic refraction and reflection; acceleration and gravity; electromagnetics; geomagnetics; waves, currents, turbulence
Physics

PB 149 544 $10.50

Michigan U. Coll. of Engineering, Ann Arbor.
THE KINETIC THEORY OF FULLY IONIZED GASES, by R. L. Guernsey. Doctoral thesis. Rept. on Contract Nonr-1224(15). July 60, 138p. 21 refs. 03114; AD-240 061.

DESCRIPTORS: *Gas flow, Theory, Integral equations, Differential equations, *Gas ionization.

The kinetic equation is derived which replaces the Boltzmann equation for a fully ionized gas. The approach is a modification of that employed by Bogolubov in obtaining the Boltzmann equation and its generalization for an ordinary gas from the Liouville equation. The earlier treatments of the equilibrium theory are reviewed and criticized. The orders of magnitude of various parameters occurring in the theory are tabulated for typical temperatures and densities. The Mayer theory of ionic solutions is investigated and the results are generalized to include expressions for the distribution functions, and some explicit calculations are made for the case when the short range forces are of hard sphere type. The same expansion is derived by an integro-differential equation method which has the advantage of being readily generalizable to non-equilibrium situations. The general formalism for obtaining the kinetic equation to an arbitrary degree of approximation is developed. The zeroth approximation is shown to be the familiar Landau-Vlasov equation. For the first approximation, an integral equation and an explicit expression as an infinite sum are derived. In the important special case of the uniform state the integral equation can be solved to give explicit expressions for the s particle distribution functions and the time derivative of the one particle distribution functions, involving only a finite number of integrals.

SCTM-96-61(73) $0.50

Sandia Corp., Albuquerque, N. Mex.
AN ACCURATE SHOCK CALIBRATION FOR ACCELEROMETERS, by D. F. Palmer. Apr 61, 15p.

Electricity and Magnetism

PB 152 635 $1.60

Space Research Labs., Litton Industries, Beverly Hills, Calif.
DETERMINING AXIALLY SYMMETRIC MAGNETIC FIELD PATTERNS, by Alan S. Penfold. Rept. on Contract AF 49(638)759. 24 May 60, 12p. Research Study 29.14; AFOSR-TN-60-842; AD-246 637.

DESCRIPTORS: *Magnetic fields, Configuration, Determination, Physical properties.

A simple method for the determination of some of the properties of a magnetic field is described. The method is applicable provided the field has a certain symmetry about one axis. The required symmetry is not seriously restricting and many field configurations of practical importance are amenable to this technique. (Author)

PB 152 634 $5.60

Space Research Labs., Litton Industries, Beverly Hills, Calif.
PARTICLE MOTION IN AN AXIALLY SYMMETRIC MAGNETIC FIELD, by Alan S. Penfold. Rept. on Contract AF 49(638)759. 24 May 60, 58p. 11 refs. Research Study 29.15; AFOSR-TN-60-841; AD-246 639.

DESCRIPTORS: Particles, Motion, *Magnetic fields, *Electromagnetic fields, Space charges, Gas discharges, *Gas ionization, *Plasma physics.

A description of the motion of charged particles in an electromagnetic field is given. The method can be applied whenever the field possesses a certain type of rotational symmetry about one axis. A cylindrical co-ordinate system is employed and the radial, axial, and circumferential motions of a particle are shown to be completely describable in terms of a scalar potential of position and time. The potential also depends on the initial angular momentum of the particle with respect to the axis of symmetry. One of the advantages of the description is that it allows an easy visualization of the primary features of the motion. When applied to a magnetic dipole field, the method is found to yield a potential which is very closely related to one which has already been used by Stormer [Astrophysica Norvegica II, 1936]. The application of the method to the initial phases of the ionization of a tenuous gas is discussed. (Author)

PB 154 069 $2.60

Bureau of Mines, Bartlesville, Okla.
HEXAMETHYLDISILOXANE: CHEMICAL THERMODYNAMIC PROPERTIES AND INTERNAL ROTATION ABOUT THE SILOXANE LINKAGE, by D. W. Scott, J. F. Messerly and others. Technical note on Contract CSO-59-9. Nov 60, 29p. 24 refs. ARPA Order no. 24-59, Task 3; AFOSR-TN-60-1396; AD-249 544.

DESCRIPTORS: *Silicones, Methyl radicals, Chemical bonds, Oxygen, Silicon, *Silanes, *Molecular spectroscopy, Molecular rotation, *Thermodynamics, Molecular structure.

Thermodynamic, spectroscopic, and molecular structure information was used to show that the barrier to internal rotation about an Si--O bond in hexamethyldisiloxane is low (about 400 cal. 0.1 mole). Thermodynamic functions for hexamethyldisiloxane in the ideal gas state (0 to 1500 k.) were calculated by methods of statistical mechanics. Experimental studies provided the following information: Values of heat capacity for the solid (11 K. to the triple point), the liquid (triple point to 380 K.) and the vapor (363 to 500 K.); the triple point temperature; the heat of fusion; thermodynamic functions for the solid and liquid (0 to 400 K.); heat of vaporization (332 to 374 K.); parameters of the equation of state; and vapor pressure (309 to 412 K.). Thermodynamic functions also were calculated for the related substance tetramethylsilane. (Author)

PB 154 085 $1.60

Denver U., Colo.
VARIATION OF INFRARED SOLAR SPECTRUM WITH ALTITUDE, by David G. Murcray, Frank H. Murcray, and Walter J. Williams. Final rept. on Contract AF 19(604)2069. 27 Oct 60, 14p. 4 refs. AFCRL-TR-60-421; AD-249 341.

DESCRIPTORS: *Infrared radiation, *Infrared spectroscopy, *Solar spectrum, Recording devices, Transmission, High altitude, Atmosphere, Sun.

A summary of the results obtained from ten balloon flights with a recording infrared solar spectrometer is presented. The water vapor distribution of the upper atmosphere as calculated from the solar spectra using the absorptions in the 6.3 micron region is compared with the humidity measurements of other workers. (Author)

PB 154 277 $17.00

Laboratory of Molecular Structure and Spectra, U. of Chicago, Ill.
TECHNICAL REPORT, 1957-9. PART TWO. Rept. for 1 Jan 57-30 Sep 58 on Contracts AF 18(600)471 and DA 11-022-ORD-1002; Rept. for 1 Jan 57-31 May 59 on Contracts AF 19(604)1019, AF 19(604)3478, and Nonr-2121(01); Rept. for 1 Apr 58-31 May 59 on Contract AF 33(616)5608. [1959] 270p. AFOSR TN-60-9; AD-232 111.

DESCRIPTORS: *Molecular structure, *Quantum mechanics, Atoms, Molecules, Electrons.

Contents: Broken bottlenecks and the future of molecular quantum mechanics; Summary of theoretical work on atoms and molecules; Self-consistent field atomic and molecular orbitals and their approximations as linear combinations of slater-type orbitals; Evaluation of molecular integrals by digital computer; Survey of digital computer programs for computation of electronic properties of atoms and molecules; Studies in molecular structure. (1) Scope and summary of the diatomic molecules program; (2) LCAO-MO-SCF wave functions for selected first row diatomic molecules; On the computation of certain multicentered molecular integrals; Orbitals atomiques correlees; Representation des fonctions atomiques de Hartree-Fock par des developements analytiques; Self-consistent field theory for open shells of electronic systems; Analytical self-consistent field functions for the atomic configurations $1s^2$, $1s^22s$ and $1s^22s^2$; Correlated orbitals for the ground state of helium-like systems; The ground state of systems of three particles with coulomb interaction; Correlated orbitals for the ground state of the hydrogen molecule; Accurate electronic wave functions for the H_2 molecule; Configuration interaction in the hydrogen molecule-the ground state; Improved molecular orbitals (computations on H_2); Quadrupole coupling constant, dipole moment, and electron population of CO; Ground state wave function for H_3 in LCAO-MO approximation. Originally published as part of "Magnetic interaction of H_3"; Theorem on the mobile bond orders of alternate conjugated systems; The role of coulomb energy in the valence-bond theory.

UCRL-9203 $2.75

Lawrence Radiation Lab., U. of California, Berkeley.
AN ANALYSIS OF THE ABSORPTION SPECTRA OF TmIV AND AmIV, by J. B. Gruber. Rept. on Contract W-7405-eng-48. Jan 61, 153p.

PB 154 274 $3.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
SYMMETRY PROPERTY OF CONFIGURATIONAL ENTROPY, by W. H. Kleiner. Rept. on Contract AF 19(604)7400. 11 Jan 61, 33p. 10 refs 81G-0026; AD-249 989.

DESCRIPTORS: Adsorption, *Molecules, *Entropy, Lattices.

Conditions under which the configurational entropy of adsorption versus coverage is symmetric about the half-coverage point are investigated for the localized adsorption model. This symmetry holds for any pair interaction model with one site per primitive unit cell, but does not hold generally. General conditions under which the symmetry holds are obtained and are discussed in terms of a simple one-dimensional model. The significance of the corresponding symmetry property for order-disorder alloys and for ferromagnetism is examined. (Author)

PB 149 591 $10.10

Massachusetts Inst. of Tech., Cambridge.
SOLID-STATE AND MOLECULAR THEORY GROUP. Quarterly progress rept. no. 37 on Contract Nonr-1841(34). 15 July 60, 123p. 151 refs. AD-240 500.

DESCRIPTORS: Solids, Theory, *Molecular spectroscopy, Atomic spectrum.

Contents:
The linear chain
Hartree-Fock scattering factors for the neutral atom iron transition series
The unrestricted Hartree-Fock method: Electron densities and magnetic form factors for spin polarized nickel
Crystalline field and spin polarization effects on electron densities and magnetic form factors
On the calculation of the crystalline field strength
Crystalline field calculation
Crystal matrices of the sodium chloride structure
Molecular orbitals for octahedral arrays of atoms
Reference table for the octahedral group
Computer programs for APW method
Energy band program
Diatomic molecule integral program for I.B.M. 704 computer
The configuration interaction study of the $^1\Sigma_1$ states o the water molecule
Formulas and programs for the evaluation of multicenter integrals
Correction to the 1951 molecular integrals of Barnett and Coulson
Automatic coding and related topics
(See also PB 154 092)

PB 149 746 $2.60

Missouri U., Columbia.
THERMIONIC EMISSION CONSTANTS AND THEIR INTERPRETATION, by Eugene B. Hensley. Technical rept. no. 25 on Contract Nonr-2296(01). 1 July 60, 30p. 22 refs. AD-241 700.

DESCRIPTORS: *Thermionic emission, Work functions, Solids, Measurement, *Cathodes.

A critical review of the procedures used in the measurement and interpretation of thermionic emission with particular reference to non-metallic cathodes is presented. Definitions are proposed for the terms "true work function", "effective work function" and "Richardson work function". The use of Schottky plots is criticized and the advantages of effective work function plots over the conventional Richardson plots are discussed. Factors relating to the interpretation of the thermionic emission which are discussed include reflection coefficients, non-uniform true work functions, temperature dependence of the electron affinity and temperature dependence of the Fermi energy. (Author)

PB 152 717 $1.60

Naval Research Lab., Washington, D. C.
AN f/2.8 LOW-DISPERSION TIME-RESOLVING GRATING SPECTROGRAPH, by F. D. Harrington. Final rept. 7 Feb 61, 15p. 6 refs. NRL rept. 5576; AD-254 512.

DESCRIPTORS: *Optical spectrometers, Design, Sensitivity.

The N4GS spectrograph is a low-dispersion time-resolving grating instrument with an aperture ratio of f/2.8. It is an image-streaking spectrograph in which the image is stationary and streaking perpendicular to the dispersion is accomplished by means of moving film. The spectrograph can be operated at either of two nominal film speeds: 9 feet per second or 90 feet per second. The time resolution is 1.3×10^{-5} second for low film speed and 1.3×10^{-6} second for high film speed operation. The total time for which an optical phenomenon can be observed is 9.75 seconds and 0.75 second for low and high film speeds respectively. The first-order wavelength coverage is from 3537.2 A to 8366.7 A on 70-mm film, and in this order the reciprocal linear dispersion is 89.2 A/mm at 5892.9 A. The wavelength resolution for two closely spaced streaked spectral lines is approximately 3 A. (Author)

PB 149 780 $6.60

Research Labs. for the Engineering Sciences, U. of Virginia, Charlottesville.
PAPERS PRESENTED BY RESEARCH LABORATORIES FOR THE ENGINEERING SCIENCES, UNIVERSITY OF VIRGINIA, CHARLOTTESVILLE, AT SYMPOSIUM ON ATOMIC AND MOLECULAR GAS BEAMS, DENVER RESEARCH INSTITUTE, UNIVERSITY OF DENVER, COLORADO, JUNE 20-22, 1960. Repts. on Contracts NOrd-18211 and Nonr-1858(25). 1960, 70p. 41 refs. Rept. no. AST-4435-104-60U; AD-240 502.

DESCRIPTORS: *Molecular beams, Scientific reports, Design, Ion beams, Sources, Supersonics, Supersonic nozzles, Symposia.

The following four papers were prepared by members of the Astronautics Division of the Research Laboratories for the Engineering Sciences, University of Virginia: (1) molecular beam research at the University of Virginia, (2) experimental analysis of molecular beams at high source pressures, (3) application of high rotational speed equipment to molecular beam technique, and (4) application of molecular beam techniques to the study of inelastic molecular collision phenomena in gases. These papers concern the development of a high intensity molecular beam source.

Optics

PB 154 878 $1.60

Air Force Cambridge Research Lab., Bedford, Mass.
A RADIATIVE EQUILIBRIUM ALGORITHM FOR SEMI-INFINITE ATMOSPHERES, by Jean I. F. King. Guenter Loeser Memorial Lecture. 1955, 19p. GRD-TN-60-603; AD-251 609.

DESCRIPTORS: *Astrophysics, Atmosphere, *Light, Light transmission, Intensity, Refraction, Scattering.

The relation between the Wiener-Hopf technique and the discrete ordinate method for the semi-infinite atmosphere is outlined. A brief treatment of the finite atmosphere case using the discrete ordinate approach is also presented. (Author)

PB 153 921 $2.60

Bausch and Lomb Optical Co., Rochester, N. Y.
INFRARED COATING STUDIES, by A. Francis Turner. Final technical rept. A, 23 July-22 Oct 59, on Contract DA 44-009-eng-3230. 8 Jan 60, 28p. AD-231 269.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Infrared photoconductors, Infrared filters, *Infrared optical materials, Arsenic compounds, Sulfides, Refractive index, Optics, Absorption, Tellurides, Lead compounds, Zinc compounds, Coatings.

Low- and band-pass filters of PbTe/ZnS were fabricated from the absorption edge of PbTe at 3.5 to 11μ. The filters were deposited on glass, As_2S_3, BaF_2, and Ge plates and exhibited good physical properties when proper cleaning and coating conditions were observed. The transmittances of band-pass filters of PbTe/ZnS were improved by employing anti-reflection coatings to reduce the reflectance losses. There is less shift in the position of the window with respect to angle of incidence when the spacer layer consists of high index material. The evaporation technique and the optical and physical properties of the CdTe were studied. Good films were produced when the initial charge was preheated at 800°C for 2 hr in a vacuum. The films subsequently formed had an absorption edge at 0.8μ, gave an index of approximately 2.7 throughout the IR from 2 to 15μ, and was free from absorption from 1.6 to 15μ. Evaporated films also showed a high electrical resistance and some degree of crystallization even when deposited on room temperature substrates. Thick films of PbTe anti-reflected with Sb_2S_3 were fabricated on mica and BaF_2 substrates. Where there was anti-reflectance, the transmittance approaches that of the substrate; below the absorption edge, the transmittance was negligible. (See also PB 153 920)

PB 149 562 $2.60

Chicago U., Ill.
PHOTOELECTRIC LINE INTENSITY PHOTOMETRY, by Bengt Strömgren. Final rept. on Contract Nonr-2331(00). July 60, 21p. 3 refs. AD-240 248.

DESCRIPTORS: *Photometers, Design, Tests, Stars, Intensity, *Astronomical data, Photomultipliers.

A 2-beam photoelectric line photometer was constructed and tested. It has been used extensively on the McDonald Observatory 36-inch reflector, and also on the 36-inch refractor of the Lick Observatory. It is now being used on the Kitt Peak National Observatory 36-inch reflector. The instrument is described and a summary of the results of the tests is given.

PB 150 530 $2.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
MODIFIED DOUBLE-SLIT INTERFEROMETER FOR SHOCK-WAVE INVESTIGATIONS, by George H. Markstein. Rept. on Project Squid, Contract Nonr-1858(25). July 60, 28p. 21 refs. Technical rept. CAL-81-P; AD-242 453.

DESCRIPTORS: *Shock waves, *Interferometers, Refractive properties, Refractive index, *Wave analysis Laboratory equipment.

The possibility of applying the Rayleigh double-slit interferometer for shock-wave investigations has been explored. In common with Rayleigh interferometers currently used for diffusion, electrophoresis, and ultracentrifuge studies, the instrument adapted for the present application contained a cylinder lens for bringing the interference fringes and the test section into simultaneous focus at the camera image plane. However, in contrast to previous applications, it was found desirable in the present work to let the light paths through both slits traverse the test section. This arrangement required a modification which consisted of tilting the axis of the cylinder lens, and the light-source slit, with respect to the conventional orientation parallel to the refractive-index gradient. Conditions under which a useful interferogram is obtained with this instrument are derived, and results of preliminary experiments are presented. Compared with the Mach-Zehnder interferometer, the double-slit instrument has the advantages of greater simplicity and ease of adjustment, lower cost, and offers the possibility of combining the interferometer with an inclined-slit Schlieren system. (Author)

PB 154 035 $1.60

Duntley, S. Q., La Jolla, Calif.
ANALYTIC VISUAL SEARCH CALCULATIONS, by James L. Harris. Rept. no. 5-10 on Contract NObs-72039, Task 5. Sep 60, 12p. 2 refs.

DESCRIPTORS: Mathematical prediction, *Optics, *Visual acuity, *Target recognition, Atmosphere, *Visual thresholds, Mathematical analysis, Light.

The purpose of this present report is to illustrate some of the advantages of analytic techniques in the analysis of visual search tasks.

PB 154 032 $1.10

Duntley, S. Q., La Jolla, Calif.
EXAMPLES OF WATER CLARITY DATA. II. Rept. no. 5-7 on Contract NObs-72039. June 60, 2p.

DESCRIPTORS: *Water, *Visibility, *Optics, Diffusion, Attenuation, *Light, *Light transmission, *Energy.

PB 154 030 $4.60

Duntley, S. Q., La Jolla, Calif.
AN INSTRUMENT FOR THE MEASUREMENT OF THE VOLUME ABSORPTION COEFFICIENT OF HORIZONTALLY STRATIFIED WATER, by John E.

Tyler. Rept. no. 5-4 on Contract NObs-72039. Feb 60, 45p. 5 refs.

DESCRIPTORS: *Water, Measurement, Instrumentation, Absorption, Scattering, Underwater photography, *Optics, Mathematical analysis, Data processing systems, Photoelectric transducers, *Light, *Light transmission.

PB 154 037 $1.60

Duntley, S. Q., La Jolla, Calif.
A NEW LOGARITHMIC PHOTOMETER, by Richard L. Ensminger. Rept. no. 6-1 on Contract NObs-72039, Task 6. Dec 60, 16p. 1 ref.

DESCRIPTORS: Functions, *Photometers, Electronic circuits, Servo systems, Voltage dividers, *Visibility, *Aircraft.

This report describes a technique which has been developed allowing conversion of quasilogarithmic data to true logarithmic form at twenty-one points over the dynamic range. The circuitry described in this report may be utilized for either of the applications described above.

PB 154 024 $1.10

Duntley, S. Q., La Jolla, Calif.
THE UNDERWATER RADIANCE DISTRIBUTION PROBLEM, by S. Q. Duntley. Rept. no. 3-6 on Contract NObs-72039. Mar 59, 9p.

DESCRIPTORS: *Water, *Optics, *Visibility, *Underwater objects, *Light, *Light transmission, *Energy, Scattering, Reflection.

PB 154 906 $1.60

Little, Arthur D., Inc., Cambridge, Mass.
OPTICAL CONSTANTS AT HIGH TEMPERATURE, by William S. Martin and Henry H. Blau, Jr. Final rept. on Contract AF 19(604)2639. Jan 61, 18p. C-60929; AFCRL-13; AD-251 662.

DESCRIPTORS: *Spectrographic analysis, *Optics, Optical spectrometers, Theory, High temperature research, Test methods, Instrumentation, Measurement, Photoemission.

An approach to high-temperature spectral emissivity measurements was investigated with respect to the following requirements: (1) self calibrating, i. e., would not require comparison with a reference standard, (2) involve relative rather than absolute measurements of radiation or temperature over a single optical path, and (3) admit qualitative evaluation of both relative and absolute errors including systematic error due to surface reference geometry. The theoretical basis of the angular variation of emission from a smooth plane surface is considered in detail. This treatment is followed by a discussion of the experimental approach and instrumentation required to exploit the method. Data are given to show the typical variation of normalized emissivity with angle of emission. Emissivity values were obtained within an accuracy of + or - 2%. The apparatus is being modified to provide greater accuracy.

PB 153 993 $2.60

Visibility Lab., U. of California, San Diego.
DIRECTLY OBSERVABLE QUANTITIES FOR LIGHT FIELDS IN NATURAL HYDROSOLS, by R. W. Preisendorfer. Rept. on Contract NObs-72092. 1 June 58, 30p. 3 refs. SIO Ref. 58-46; AD-201 547.

DESCRIPTORS: *Optics, Absorption, Determination, Scattering, *Water, *Light, *Light transmission, Mathematical analysis, *Energy.

The increasing accuracy of experimental determinations of the optical absorption and scattering properties of oceans, lakes, and harbors has necessitated exact knowledge of the possible interrelations between these properties. The classical two-flow analysis of the light field has been an important source of such relations. While it continues to be a source of useful simple models for engineering calculations, it has become inadequate to collate the data of basic experimental research. The two-flow theory is reformulated to meet these experimental needs. The reformulation is based on the exact equations for the light field in scattering-absorbing media. The main results give useful relations between the magnitudes of the downwelling and upwelling irradiances, their depth-rates of change, and the scattering and absorption properties of natural hydrosols. The reformulations are applicable in general to arbitrarily stratified plane-parallel media. (Author)

PB 153 972 $1.60

Visibility Lab., U. of California, San Diego, Calif.
FUNCTIONAL RELATIONS FOR THE R AND T OPERATORS ON PLANE-PARALLEL MEDIA, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. 14 Nov 57, 11p. 2 refs. SIO Ref. 57-47

DESCRIPTORS: *Operators (Mathematics), Functions, *Light, *Light transmission, *Energy, *Visibility, Mathematical analysis, *Optics.

This note considers the case of finite, non-separable plane-parallel media. The study of these media requires not two but four functions: a reflectance-transmittance pair for each of the two boundaries of the medium. The four principles of invariance for a non-separable plane-parallel medium for formulated, and are found to be just sufficient to yield the appropriate integro-differential equations governing the four functions.

PB 153 991 $2.60

Visibility Lab., U. of California, San Diego.
MODEL FOR RADIANCE DISTRIBUTIONS IN NATURAL HYDROSOLS, by R. W. Preisendorfer. Rept. on Contract NObs-72092. 1 Aug 57, 21p. 6 refs. SIO Ref. 58-42.

DESCRIPTORS: Differential equations, *Underwater objects, *Water, *Optics, *Light, *Light transmission, Mathematical analysis, *Energy, *Visibility.

A simple model for radiance distributions in optically deep natural hydrosols is derived from the equation of transfer for radiance using a special form of the path function derived from the classical two-flow Schuster differential equations for irradiance. The model yields explicit expressions for the apparent radiance of submerged objects and the contrast transmittance for arbitrary paths of sight in the hydrosol. The model reproduces the major features of experimentally determined radiance distributions under a variety of external lighting conditions. (Author)

PB 153 970 $1.60

Visibility Lab., U. of California, San Diego.
A NEPHELOMETER FOR THE MEASUREMENT OF VOLUME SCATTERING FUNCTION, by John E. Tyler and William H. Richardson. Rept. on Contract NObs-72092. 7 Oct 57, 16p. 4 refs. SIO Ref. 57-43.

DESCRIPTORS: *Water, Scattering, Reflection, Measurement, Microorganisms, Bubbles, Instrumentation, *Optics, *Light, *Light transmission, Energy.

PB 153 994 $1.60

Visibility Lab., U. of California, San Diego.
ON THE EXISTENCE OF CHARACTERISTIC DIFFUSE LIGHT IN NATURAL WATERS, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. 8 Aug 58, 17p. 8 refs. SIO Ref. 58-59; AD-206 112.

DESCRIPTORS: *Light, Diffusion, *Water, *Optics, Mathematical analysis, *Light transmission, *Energy

It is shown that the radiance distributions in homogeneous natural waters approach an asymptotic radiance distribution with increasing depth. In this way the conjecture by L. V. Whitney concerning the existence of characteristic diffuse light in natural waters is proved. A brief discussion is included of the equations governing the angular form of the characteristic diffuse light. (Author)

PB 153 997 $2.60

Visibility Lab., U. of California, San Diego.
THE OPTICAL PROPERTIES OF LAKE PEND OREILLE, by J. E. Tyler, W. H. Richardson, and R. W. Holmes. Rept. on Contract NObs-72092. 31 Dec 58, 25p. 5 refs. SIO Ref. 58-80; AD-212 696.

DESCRIPTORS: *Optics, *Water, Measurement, *Light, *Light transmission, Mathematical analysis, *Energy

Eight important optical properties have been obtained for Lake Pend Oreille, Idaho, using the method of measurement of radiance distribution as a function of depth. The method for computing the properties from radiance distributions is given in detail. These properties are associated with a narrow band of wavelengths at 480 mμ and are given for a single depth. They should be characteristic of the lake water in the absence of plankton or excess contamination. (Author)

PB 153 985 $2.60

Visibility Lab., U. of California, San Diego.
THE REDUCTION OF CONTRAST BY ATMOSPHERIC BOIL, by S. Q. Duntley, W. H. Culver and others. Rept. on Contract NObs-72092. 1 July 58, 27p. 7 refs. SIO Ref. 58-35.

DESCRIPTORS: Mathematical prediction, *Light transmission, *Atmosphere, *Optics, Targets, Mathematical analysis, *Light, *Energy.

The probability of receiving light from an object viewed through a turbulent atmosphere follows a normal Gaussian distribution. Furthermore the root mean square angular deflection of the points of any object will be proportional to the square root of the object-to-observer distance. From relations of the type described in the examples, it is possible to predict the apparent contrast throughout a given scene, provided the inherent contrast distribution, the Optical Air State, and the range of the target is known. The Optical Air State for a given condition of atmosphere can be measured using a telephotometer and a series of long thin black bars of varying widths. (Author)

PB 153 996 $1.60

Visibility Lab., U. of California, San Diego.
SIMPLE FORMULAS FOR THE VOLUME ABSORPTION COEFFICIENT IN ASYMPTOTIC LIGHT FIELDS, by R. W. Preisendorfer and W. H. Richardson. Rept. on Contract NObs-72092. 21 Nov 58, 11p. 5 refs. SIO Ref. 58-79; AD-212 742.

DESCRIPTORS: *Light, *Optics, Mathematical prediction, Absorption, Functions, *Light transmission, *Energy

The properties of the light field in optically deep homogeneous stratified media become extremely regular and predictable at great depths. This note derives some further consequences from this regularity.

PB 153 998 $2.60

Visibility Lab., U. of California, San Diego.
TEMPORAL METRIC SPACES IN RADIATIVE TRANSFER THEORY. I. TEMPORAL SEMIMETRICS, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. 1 Jan 59, 25p. 7 refs. SIO Ref. 59-2; AD-212 698.

DESCRIPTORS: Topology, Integral equations, Neutrons, Scattering, *Light, *Light transmission, *Energy, Mathematical analysis, *Optics.

The ultimate purpose of this study is to lay the groundwork for a topological characterization of the general

time-dependent transport processes common to the theory of radiative transfer and neutron transport phenomena. The first part of the study is concerned with the introduction and illustration of the notion of the temporal semimetric on a general carrier space.

PB 153 999 $3.60

Visibility Lab., U. of California, San Diego.
TEMPORAL METRIC SPACES IN RADIATIVE TRANSFER THEORY. II. EPOCH TIMES AND CHARACTERISTIC FUNCTIONS, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Feb 59, 38p. 3 refs. SIO Ref. 59-7; AD-212 700.

DESCRIPTORS: Functions, Topology, *Light, *Light transmission, *Energy, Mathematical analysis, Scattering, Theory

This paper introduces the notions of least epoch time and local epoch time by means of the radiative process on an arbitrary carrier space and shows under what conditions they allow various temporal metrics to be introduced into the carrier space. (See also PB 153 998)

PB 154 000 $3.60

Visibility Lab., U. of California, San Diego.
TEMPORAL METRIC SPACES IN RADIATIVE TRANSFER THEORY. III. CHARACTERISTIC SPHEROIDS AND ELLIPSOIDS, by Rudolph W. Preisendorfer. Rept. on Contract NObs-72092. Feb 59, 40p. SIO Ref. 59-10; AD-214 121.

DESCRIPTORS: *Ellipsoids, Time, Relativity theory, Topology, Scattering, *Light, *Optics, Functions, *Light transmission, *Energy, Scattering, Mathematical analysis.

The main emphasis of this paper is on the development of a new set of concepts in radiative transfer theory which may eventually broaden its scope of applicability and draw it closer to the discipline of topological dynamics. (See also PB 153 999)

PB 153 992 $4.60

Visibility Lab., U. of California, San Diego.
UNIFIED IRRADIANCE EQUATIONS, by R. W. Preisendorfer. Rept. on Contract NObs-72092. 22 Aug 57, 42p. 28 refs. SIO Ref. 58-43.

DESCRIPTORS: *Light, *Light transmission, *Energy, *Visibility, *Optics, Mathematical analysis, Scattering, Theory, Differential equations.

The necessary structure of the coefficient functions occurring in the Schuster equations is found in order that they be consistent with the scattering functions of general radiative transfer theory. The general procedure followed yields a base for the unification of the manifold forms of the equations used in practice and provides an objective means for their evaluation. Necessary and sufficient conditions are given in order that the Schuster equations be exact. In illustration of theory, an extension, based on recent experimental evidence, is made of the classical equations to the case of two flows whose radiance distributions have distinct angular structure. Finally, the n-flow non steady state Schuster equations are rigorously derived from the equation of transfer for an arbitrary optical medium with sources. (Author)

Solid State Physics

PB 149 836 $2.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON THE FIRST BOUNDARY-VALUE PROBLEM OF LINEAR ELASTOSTATICS, by M. E. Gurtin and Eli Sternberg. Technical rept. no. 9 on Contract Nonr-562(25). July 60, 22p. 12 refs. Rept. 562(25)/9; AD-241 063.

DESCRIPTORS: *Solids, *Elasticity, Mathermatical analysis, Stresses, Equations, Differential equations.

The present paper is concerned exclusively with the first problem of elastostatics, in which the surface-displacements are prescribed on the boundary B of the region of space D.

PB 149 886 $3.60

Carnegie Inst. of Tech., Pittsburgh, Pa.
THE LOW TEMPERATURE MAGNETIC SUSCEPTIBILITIES OF THE HYDRATED ACETATES OF Ni++, Co++, and Mn++, by R. B. Flippen (Doctoral thesis) and S. A. Friedberg. Technical rept. no. 7 on Contract Nonr-760(05). 27 July 60, 31p. 23 refs. AD-241 752.

DESCRIPTORS: *Acetates, Nichel compounds, Cobalt compounds, Manganese compounds, *Magnetic susceptability, Low temperature research, Measurement, Single crystals, Powders, Hydrates.

The magnetic susceptibilities of powdered $Ni(C_2H_3O_2)_2 \cdot 4H_2O$, $Co(C_2H_3O_2)_2 \cdot 4H_2O$, and $Mn(C_2H_3O_2)_2 \cdot 4H_2O$ have been measured in the liquid hydrogen and helium ranges by an a.c. mutual-inductance method. Measurements on the cobalt salt were extended to 0.4°K revealing a sharp maximum at 0.6°K. A similar, more pronounced susceptibility peak is observed in the manganous acetate at 3.2°K. Single crystal measurements have been made on the latter salt along the monoclinic b axis as well as in the ac plane in external fields up to 1000 gauss. Saturation and hysteresis are seen in the a direction apparently associated with the appearance of a weak ferromagnetic moment below 3.18°K. $Mn(C_2H_3O_2)_2 \cdot 4H_2O$ appears to be a weak ferromagnet of the kind discussed recently by Dzyaloshinsky [Jnl. of Phys. and Chem. of Solids 6:241, 1958] and Moriya [Phys. Rev. 117:635, 1960; Phys. Rev. Letters 4:228, 1960]. (Author)

PB 154 253 $2.60

Compagnie Générale de Télégraphie Sans Fil (France).
A PREPARATION AND STUDY OF COMPOUNDS OF THE II-IV TYPE AND MIXTURES THEREOF TO DETERMINE USEFUL SEMI-CONDUCTING PROPERTIES, by H. Guennoc. Quarterly technical status rept. no. 6, 1 July-30 Sep 60, on Contract AF 61(052)243. [1960] 30p. 9 refs. AD-249 438.

DESCRIPTORS: *Semiconductors, Electrical properties, *Magnesium alloys, Intermetallic compounds, *Lead alloys, *Tin alloys, Resistance, Germanium alloys, Preparation, Heat treatment, Crystallization, Microstructure, Thermoelectricity, Thermal diffusion.

Previous efforts resulted in a fairly marked dispersion of the results of measurements made with mixtures of compounds of the type (AII) 2 (BIV) (Mg2 Pb, Mg2 Sn, Mg2 Ge). This dispersion was attributed to the absence of real solid solutions in the mixtures. This problem was re-examined. Two methods were developed to produce solid solutions : extended annealing of materials obtained by fusion of the constituent materials followed by quenching and recrystallisation of quenched ingot by the zone melting method. (Author) (See also PB 148 213)

PB 154 981 $3.60

Compagnie Générale de Télégraphie Sans Fil (France).
A PREPARATION AND STUDY OF COMPOUNDS OF THE II-IV TYPE AND MIXTURES THEREOF TO DETERMINE USEFUL SEMI-CONDUCTING PROPERTIES, by H. Guennoc. Quarterly technical status rept. no. 7, 1 Oct-30 Dec 60, on Contract AF 61(052)243. [1961] 32p. 2 refs. AD-252 291.

DESCRIPTORS: *Semiconductors, Electrical properties, *Magnesium alloys, Intermetallic compounds, *Lead alloys, Germanium alloys *Tin alloys, Resistance, Preparation, Heat treatment, Crystallization, Microstructure, Thermoelectricity, Thermal diffusion.

The efforts pursued in order to improve the metallurgy of magnesium compounds (Mg_2Pb, Mg_2Ge, Mg_2Si) and of their mixtures have led to results of interest. Solid solutions of formula Mg_2Sn sub x Pb sub 1-x have been obtained and their homogeneity checked by metallographic techniques, X-ray and quantitative measurements by means of the Castaing Probe. The variations of resistivity and Hall constant of these materials versus temperature are characteristic of semiconductors. Concurrently, metallurgy of mixture Mg_2 Sn sub x Pb sub 1-x has progressed. The very existence of a solid continuous solution between Mg_2 Sn and Mg_2Ge has been checked by means of metallographic methods, X-ray of these same crystals, presently carried on, has up to now, confirmed these results. (Author) (See also PB 154 253)

PB 150 559 $3.60

Honeywell Research Center, Hopkins, Minn.
MECHANICAL PROPERTIES OF TELLURIUM SINGLE CRYSTALS, by R. J. Stokes, T. L. Johnston, and C. H. Li. Technical rept. no. 9 on Contract Nonr-2456(00). July 60, 34p. 16 refs. HR-60-497; AD-243 104.

DESCRIPTORS: *Metallic crystals, Single crystals (Metallurgy), *Tellurium, Deformation, Plastic flow, Crystal structure, Lattices, Single crystals, Shear stresses, Mechanical properties.

The mechanical behavior of chemically polished tellurium single crystals have been determined for the three following orientations; (I) tension direction parallel to [1120], (II) parallel to [1010] and (III) parallel to [0001] direction. Slip occurs in the <1120> directions over [1010] planes which are also the planes of cleavage. Specimens favorably oriented for slip (i.e. I and II) are extremely soft (critical res. shear stress, 300 psi) and ductile, (exceeding 20% elongation), providing great care is taken in their preparation and handling. For crystals of orientation I the active slip plane rotates towards the plane of maximum shear stress favoring continued single slip. For orientation II, reorientation during plastic flow raises the stress on the inactive plane and favors duplex slip. A higher rate of work hardening for orientation II than for I and the appearance of slip bands for the two orientations are consistent with this expected difference in slip behavior. For orientation III there is no shear stress over [1010], these specimens are strong and brittle. They can support normal stresses of 20,000 psi without plastic deformation. The deformation and fracture characteristics for each orientation can be correlated with the anisotropy of the chemical bonding in tellurium. The nature of the dislocations and their interactions are also discussed. (Author)

PB 150 246 $2.60

Illinois U., Urbana.
STRAIN ENERGY EXPRESSIONS FOR LARGE DEFLECTIONS OF HEATED RECTANGULAR PLATES INCLUDING EFFECTS OF TRANSVERSE SHEAR, by A. P. Boresi and P. E. Wilson. Technical rept. 7 on Contract Nonr-1834(14). July 60, 23p. 11 refs. T & AM rept. no. 170; AD-242 984.

DESCRIPTORS: Sheets, *Metal plates, *Deflection, Deformation, Stresses, *Shear stresses, Temperature, Sandwich construction, Structures, Mathematical analysis, Elasticity, Energy.

A strain energy expression is derived which includes the effect of transverse shear for large deflections of plates. Temperature effects are included in the strain energy density function. The material is assumed to be linearly elastic and isotropic. For completeness, with the objective of application of energy methods, the potential energy due to external edge loads and lateral pressure is derived. (Author)

PB 153 474 $11.00

ITT Labs., Nutley, N. J.
THE SOLID STATE INFRARED MASER FEASIBILITY STUDY, by M. Hirsh, L. Leopold and others. Rept. on Solid State Research and Properties of Matter, Contract AF 33(616)6351. Feb 61, 144p. 31 refs. ARL Technical rept. 60-328; AD-244 491.

DESCRIPTORS: *Infrared equipment, *Microwave amplifiers, *Semiconductors, Quantum mechanics, Spin, Nuclear spins, Paramagnetic resonance, *Electrons, Tests, Silicon, Magnetic fields, Indium alloys, Antimony alloys, Intermetallic compounds.

A far infrared Maser utilizing the spins of conduction electrons in negative g-factor semiconductors is described. It is shown that negative spin temperatures can be obtained by injecting electrons into the material from a positive g-factor semiconductor, provided the spin quantum numbers of the electrons do not change at the junction. A theoretical calculation of spin transitions at the junction between degenerate n-type silicon and p-type indium antimonide indicates that a change of spin quantum number at injection is very improbable for a wide range of material parameters. Calculations shows that stimulated emission more than compensates for conduction loss at frequencies up to at least $3x10^{12}$cp, and yields net gain. The results of spin resonance measurements are presented for degenerate silicon, and a line broadening effect due to surface oxide layers is described. I-V characteristics are shown for silicon p-n junctions, but spin resonance of injected electrons has not yet been observed in them. A new magnetoresistive effect for injected electrons in silicon p-n junctions has been observed at d.c. and microwave frequencies, and its importance to the present work is discussed. Although the experimental program is still incomplete, the feasibility of the Maser has been clearly shown theoretically. (Author)

PB 153 766 $2.60

Little, Arthur D., Inc., Cambridge, Mass.
A RADIATION TECHNIQUE FOR THE MEASUREMENT OF THERMAL CONDUCTIVITY OF SEMICONDUCTORS BETWEEN 1000 AND 2000°C. Progress rept. 14 Oct 59-1 Mar 60, on Contract Nonr-2974(00). 1 Mar 60, 30p. 7 refs. Rept. C-62403; AD-234 123.

DESCRIPTORS: *Semiconductors, *Thermal radiation, Conductivity, Measurement, Thermoelectricity, *Instrumentation, Design, Radiation instruments.

Experimental work is summarized on measuring thermal conductivity of semiconductors between temperatures of 1000 and 2000°C. The assumptions are detailed regarding the semiconductors to be used in the tests, the instrumentation being developed, and the heat source that will be used. (Author)

PB 154 951 $3.60

Morgan State Coll., Baltimore, Md.
ELECTRICAL AND OPTICAL PROPERTIES OF SEMICONDUCTORS UNDER HYDROSTATIC PRESSURE, by Julius H. Taylor. Final rept. on Contract DA 36-034-ORD-2298. Mar 59, 37p. 6 refs. AD-218 043.

DESCRIPTORS: *Semiconductors, *Electrical properties, *Optics, Hydrostatic pressure, Resistance, Mathematical analysis.

Results are presented of measurements of the effect of pressure on the resistivity, Hall coefficient, and the fundamental absorption edge for a number of well-known semiconductors. The results indicate that the energy gap increases linearly with pressure over the pressure range used in these experiments. Pressure induces changes in the carrier concentrations and mobilities which are related to the electrical and optical properties by relationships that are derived or given with references under Theory.

PB 155 217 $1.10

Pavia U. (Italy).
STUDY OF LOCALIZED EXCITONS IN ALKALI HALIDE CRYSTALS, by G. Chiarotti, G. Giulianai, and D. W. Lynch. Technical note no. 1 on Contract AF 61(052)423. 5 Oct 60, 9p. 8 refs. AFOSR 134; AD-252 859.

DESCRIPTORS: *Crystals, Single crystlas, *Chlorides, *Potassium compounds, *Sodium compounds, *Lattices, *X-ray spectroscopy, Spectrographic analysis, Absorption, Excitation, Alkali metal compounds, Halides.

Alpha and beta bands have been observed in KCl and NaCl crystals additively colored or X-rayed at liquid nitrogen temperature. The energy position of the two bands in various alkali halides is compared with available calculations. (Author)

PB 155 303 $3.60

Raytheon Co., Waltham, Mass.
BETA SILICON CARBIDE, by D. M. Warschauer. Final rept. 1 Dec 59-30 Nov 60, on Contract AF 19(604)6133. 30 Jan 61, 35p. 1 ref. S-242; AFCRL-60; AD-253 075.

DESCRIPTORS: Crystals, Growth, Single crystals, *Silicon compounds, *Carbides, *Semiconductors, Spectrographic analysis, Electrical properties, Absorption.

The work on growing single-crystal silicon carbide in the cubic phase by gaseous cracking of silicon tetrachloride and by growth from elemental silicon fused in a carbon crucible is summarized. Examples of crystals grown by each of these methods are shown. Crystallographic and electrical measurements are treated. Optical data pertinent to the absorption edge and its temperature dependence as gathered from these samples is discussed. (Author) (See also PB 152 628)

PB 155 098 $1.60

Raytheon Co., Waltham, Mass.
SINGLE GROWTH OF THE GARNET TYPE OXIDES. PART II. PHASE RELATIONS IN THE TERNARY SYSTEM Fe_2O_3-FeO-$YFeO_3$, by H. J. Van Hook. Scientific rept. no. 2 on Contract AF 19(604)5511. 9 Jan 61, 20p. 10 refs. S-229; AFCRL-52; AD-252 397.

DESCRIPTORS: Single crystal, Growth, Oxides, Iron compounds, Yttrium compounds, Phase studies, Temperature, Pressure, *Ferromagnetic materials, Crystallization, X-ray diffraction analysis, *Garnets.

Equilibrium data are presented for the ternary system, Fe_2O_3-FeO-$YFeO_3$, in ambient atmospheres of air, O, and CO_2 at melting temperatures. The temperature range for the coexistence of Y-Fe garnet and oxide liquid decreases with decreasing O partial pressure from 127C in O to 86C in air to 20C in CO_2. In addition, the composition of the garnet phase crystallizing from these melts changes with variations of temperature and O pressure. The experimental data are discussed in terms of a polythermal-polybaric model of the system. Some conclusions are drawn as to the limiting conditions in different atmospheres for the growth and the resulting composition of Y-Fe garnet crystals in equilibrium with ternary oxide liquids. (Author) (See also PB 147 056)

PB 155 163 $6.60

Sawyer Research Products, Inc., Eastlake, Ohio.
PILOT PLANT PRODUCTION OF SYNTHETIC QUARTZ, by Baldwin Sawyer. Final rept. 1 Jan 57-21 Apr 58 on Industrial Preparedness Study on Synthetic Quartz, Contract DA 36-039-sc-72736. [1958] 69p. AD-218 931.

DESCRIPTORS: *Quartz crystals, Growth, Crystals, Sterilizers, *Quartz, Manufacturing methods.

Electronic-grade synthetic quartz Y-bar crystals were produced from Lascas grade natural quartz in a newly designed autoclave. The cylindrical cavity inside the autoclave is divided into 2 chambers by a baffle located at its middle height. The quartz crystals are grown on seeds placed in the upper chamber by means of the transport of dissolved silica carried in a sodium carbonate-water solution. At elevated temperatures and pressures, the solution dissolves the quartz in the lower chamber which is charged with a supply of natural quartz of lower quality than electronic grade. Only the lower chamber is heated. The electric power which is supplied to the heaters is controlled by potentiometer-type instruments. The main heating elements consist of resistance wire elements in compacted magnesium oxide. During crystal growth, crystal size is measured nondestructively with a gammagraph.

PB 149 300 $8.10

Smith, A. O., Corp., Milwaukee, Wis.
SEMICONDUCTING PROPERTIES OF AMORPHOUS MATERIALS, by H. L. Uphoff and J. H. Healy. Final rept. 27 July 59-26 July 60, on Contract Nonr-2965(00). [1960] 83p. 18 refs. AD-240 078.

DESCRIPTORS: *Semiconductors, Resistance, Electrical conductance, Thermoelectricity, Heat transfer, Arsenic, Selenium, Tellurium, Sulfur.

Ten compositions in the systems As:Se:Te and As:S:Te were synthesized, and nine of the ten were amorphous in structure. The resistivities of the materials in both systems were determined at temperatures up to 373°K. The resistivities varied exponentially with the inverse of the absolute temperature. The Seebeck coefficient values of the amorphous materials in the system As:Se:Te were determined over the same temperature range as the resistivity values. The thermal conductivities of the materials in the system As:Se:Te were determined. The test results indicated that the materials are probably semiconductors. The experimental data were used to estimate activation energy, carrier concentration and carrier mobility values. The theoretical bases of these calculations were considered. (Author)

Theoretical Physics

PB 154 832 $13.00

Bonn U. (West Germany).
CURRENT TRANSITION GAS-METAL. II. ELECTRODE DISCHARGE COMPONENTS OF THE GLOW DISCHARGE, by G. Ecker and K. G. Müller. Technical rept. FTR 2 on Contract DA 91-591-EUC-1254. 30 Jan 61, 182p. 1156 refs. AD-251 976.

DESCRIPTORS: Glow discharges, Electrodes, *Electric arcs, Stability, Bibliography, Gases, Metals.

A critical review of the phenomena of glow discharge and the actions taking place at the electrodes. (See also PB 143 107)

PB 154 913 $13.50

Electrical Engineering Research Lab., U. of Illinois, Urbana.
EXPERIMENTAL STUDY OF THE DIAMAGNETISM OF THE ELECTRON GAS IN GASEOUS PLASMAS WITH ELECTRON AND NUCLEAR SPIN RESONANCE TECHNIQUES. by T. C. Marshall, R. A. Kawcyn, and L. Goldstein. Scientific rept. no. 8 on Contract AF 19(604)2152. 1 Nov 60, 192p. 46 refs. AFCRL-110; AD-251 753.

DESCRIPTORS: *Plasma physics, *Quantum mechanics, *Magnetic fields, *Nuclear resonance, Electrons, Spin, Magnetic moments, Gases.

Experimentally, the diamagnetism of active discharge plasmas was observed by allowing the local magnetic field from an active plasma to influence the spin resonance absorption frequency of a foreign substance located near the plasma. This local field originates in the rotary motion of the plasma charges, and is not caused by the macroscopic discharge tube current. (Author)

PB 149 004 $1.10

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
ELECTRON DENSITY DISTRIBUTION IN A CYLINDER, by H. D. Weymann. Rept. on Contract AF 49(638)401. July 60, 10p. 2 refs. Technical note BN-214; AFOSR-TN-60-704; AD-239 342.

DESCRIPTORS: Cylindrical bodies, *Shock tubes, Plasma physics, *Electrons, Density, Analysis, Shock waves, Argon, Diffusion, Distribution.

The radial electron density distribution in an infinitely long cylinder was calculated for the equilibrium case. It is found that the density on the axis of the cylinder approaches a finite value n^*_{max} when the mean density goes to infinity. (Author)

PB 153 969 $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
SHOCK WAVES IN RADIATION-MAGNETOGASDYNAMICS, by S. I. Pai and A. I. Speth. Rept. on Contract AF 49(638)401. Nov 60, 24p. 6 refs. Technical note BN-223; AFOSR-38; AD-249 846.

DESCRIPTORS: *Electromagnetic fields, Gases, Gas flow, Electromangetic waves, *Shock waves, Fluid mechanics, *Magnetohydrodynamics, Absorption, *Plasma physics, Radiation effects.

The general Rankine-Hugoniot relations for a normal shock wave in radiation-magnetogasdynamics were investigated. It was found that these relations differ considerably from those without radiation effects, particularly for the case that the gas is initially so hot that the radiation pressure is not negligible. For a given strength of the shock wave, the temperature jump across the shock with radiation effect is much smaller than that without radiation effect. Various limiting cases were discussed. In certain cases the results may be expressed in terms of an effective ratio of specific heats and an effective gas pressure. A general method of solution by successive approximations is given. Some numerical results are obtained. (Author)

PB 155 179 $6.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
REENTRY PHYSICS PROGRAM. Semiannual technical summary rept. no. 4, 1 July-31 Dec 60, on Contract AF 19(604)7400. 8 Feb 61, 69p. 25 refs. AD-252 669.

DESCRIPTORS: *Re-entry vehicles, Electrons, *Atmosphere entry, Plasma physics, Density, S-band, X-band, Radar tracking, Gas flow, Gas ionization, *Re-entry aerodynamics, Scattering.

Contents: Flow field studies: Flow field calculations for Trailblazer I vehicles by GASL; Equilibrium electron density profiles in the shock layer; Far-wake calculations. Electronic properties of reentry plasmas: Electron density measurements in the wakes of hypervelocity pellets; Initial electron density; Electron removal rate and wake temperature; Doppler measurement of wake velocity and electromagnetic reflectivity. Electromagnetic interactions with reentry plasmas: S-band experiments; UHF experiments; Scattering from an infinite plasma cylinder; Analysis of normal modes on open plasma structures; Double-probe measurement for plasma wakes; Passive radiation; Analysis of radar scattering data. The experimental program at Wallops Island: Trailblazer I; Trailblazer II; S-band radar; X-band; Data processing; Wallops Island Rocket Experiments; Optics.

PB 155 054 $2.60

Plasma Propulsion Lab., Republic Aviation Corp., Farmingdale, N. Y.
AN ANALYTICAL APPROACH TO THE PROBLEM OF PINCH DYNAMICS, by Boa-Teh Chu (Brown U.). Rept. on Contract AF 49(638)552. Nov 60, 27p. 6 refs. PPL-TR-60-9 (185); AFOSR-19; AD-252 112.

DESCRIPTORS: *Magnetohydrodynamics, Gases, *Magnetic pinch, Shock waves, Ionization, Fluid mechanics, Hydrodynamics, *Ion rockets, Mathematical analysis, Differential equations.

The motion of a gas between two parallel circular electrodes during the pinch process is analyzed from the fluid dynamical viewpoint. The solution is presented in the form of a double-series expansion, the first term of which agrees with that deduced from the snow plow model. The higher-order terms in the expansion give a detailed description of the motion of the gas between the advancing shock and the current sheath. (Author)

PB 155 055 $3.60

Plasma Propulsion Lab., Republic Aviation Corp., Farmingdale, N. Y.
A REVIEW OF REPUBLIC'S PINCH ENGINE EXPERIMENTAL PROGRAM, by Irving Granet and William J. Guman. Rept. on Contracts Nonr-2851(00) and AF 49(638)552. 21 Oct 60, 40p. PPL-[TR]-60-15 (160); AFOSR-164; AD-252 113.

DESCRIPTORS: *Magnetohydrodynamics, *Magnetic pinch, Scientific research, Instrumentation, Plasma physics.

Contents:
General
Test rig
Electrode nozzles
Capacitors
Vacuum chamber and vacuum pumping subsystem
Electrical subsystem
Control console
Triggered gap switch
Fast acting gas valve
Diagnostics
Rotating drum camera, rotating mirror camera
Light probes, magnetic probes
Thrust measuring devices
Surface thermocouples

Schlieren-shadowgraph system
Velocity spectrometer
Experimental results
Plasma velocity
Mass measurements
Electrodynamic parameters of the system
Thrust
Pinch initiation.

PB 152 636 $2.60

Space Research Labs., Litton Industries, Beverly Hills, Calif.
A MODEL FOR THE MOTION OF A RAREFIED PLASMA IN AN AXIALLY SYMMETRIC MAGNETIC FIELD, by Allan S. Penfold. Rept. on Contract AF 49(638)759. 15 July 60, 28p. 5 refs. Research Study 29.16; AFOSR-TN-60-961; AD-246 638.

DESCRIPTORS: Particles, Motion, *Magnetic fields, *Electromagnetic fields, Gas discharges, Space charges, *Gas ionization, *Plasma physics.

Equations of motion are derived for the charged constituents of a tenuous plasma immersed in a time-dependent, axially symmetric, magnetic field. An ion-pair model is employed which assumes strong coloumb forces. The motion of the ion-pair is shown to be closely related to that of an isolated positively charged particle whose mass is equal to the geometric mean of the ion and electron masses. Equations for the energy transferred from the field to the ion-pair are also derived. (Author)

PB 154 065 $6.60

Stevens Inst. of Tech., Hoboken, N. J.
PLASMA PHYSICS, LECTURE NOTES, CHAPTER I-II, by George Schmidt. Rept. for 1959-60 on Contract AF 49(638)156. 1960, 70p. 29 refs. SIT P24(10/60); AFOSR-TN-60-1481; AD-248 991.

DESCRIPTORS: *Electromagnetic fields, Theory, *Plasma physics, *Magnetic fields, Analysis, *Particles.

Contents:
Motion of charged particles in electromagnetic fields
Static magnetic field
The guiding center approximation; dipole like motion
The guiding center approximation; inertial forces
The guiding center approximation; constancy of the magnetic moment
Particle motion in fields with spatial symmetry; the Hamiltonian formalism
Adiabatic invariants
Static magnetic and time varying electric fields
High frequency fields; oscillation center approximation.

PB 154 066 $8.10

Stevens Inst. of Tech., Hoboken, N. J.
PLASMA PHYSICS, LECTURE NOTES, CHAPTER III-IV, by George Schmidt. Rept. for 1959-60 on Contract AF 49(638)156. 1960, 81p. 55 refs. SIT P24a(11/60); AFOSR-TN-60-1482; AD-249 246.

DESCRIPTORS: *Plasma physics, Equations, Thermodynamics, Magnetohydrodynamics, Theory, Analysis.

Contents:
Plasma equations: general laws
The Boltzmann equation
Moments of the Boltzmann equation
Other forms of conservation laws
Solutions of the Boltzmann equations
Thermodynamic properties of plasmas
Fluids and plasmas
Magnetohydrodynamics
Fundamental equations
Magnetic field lines
Magnetohydrostatics
Hydromagnetic waves
Domain of validity of the hydromagnetic equations
(See also PB 154 065)

PB 154 345 $4.60

University of Southern California, Engineering Center, Los Angeles.
INTERACTION BETWEEN A PLASMA AND A MICROWAVE, by Toyoki Koga. Technical note on Contract AF 49(638)831. Nov 60, 43p. 13 refs. USCEC rept. 83-202; AFOSR-3; AD-250 254.

DESCRIPTORS: *Plasma physics, Microwaves, *Electrons, Density, Mathematical analysis, Propagation, Magnetic fields.

A method of investigating the interaction between a plasma and a microwave is proposed. The electric field caused by electrons, the ionization and recombination are taken into account. The displacement amplitude of electron oscillations is assumed to be small as compared with the wavelength. The number, the current, and the energy densities, as functions of time, are obtained together with the damping rate and phase-shift of the microwave. The results are almost exact solutions of the assumed basic equations. In a limiting case, the results agree with those of Margenau. This method will be valid also in cases where magnetic fields are taken into account. (Author)

PB 155 418 $1.60

Weizmann Inst. of Science (Israel).
ON THE CALCULATION OF THE t-MATRIX FOR POTENTIALS WITH A HARD CORE, by A. S. Reiner and J. M. J. van Leeuwen (Instituut voor Theoretische Physica). Technical note no. 5 on Contract AF 61(052)337. 1 Sep 60, 20p. 9 refs. AFOSR-99; AD-253 340.

DESCRIPTORS: Matrix algebra, *Quantum mechanics, *Quantum statistics.

An explicit calculation of the t-matrix for general complex argument is described for potentials consisting of a chain of rectangular wells. Details are given for the hard sphere interaction and the Herzfeld potential. The method is compared with the resolvent method, pointing out the care needed when a hard core is present in the interaction. (Author)

PB 154 421 $4.60

Air Force Inst. of Tech. [Wright-Patterson AFB, Ohio].
DETERMINATION OF THERMAL EXPANSIVITY OF ZIRCONIUM HYDRIDE, by Russel Riegel Rentschler. Master's thesis. Mar 57, 50p. GNE-57; AD-131 788.

This report released for sale to the public 1 June 61.

DESCRIPTORS: *Dilatometers, Design, *Zirconium compounds, *Hydrides, Determination, *Thermal expansion.

This report recounts the unique features of ZrH_4 which were considered. How a dilatometer was designed, calibrated, and used to determine the thermal expansivity of several sample hydrides of Zr are reported. Only one sample of each hydride was tested. However, experimental results indicate that the thermal expansivity of hydrides of Zr increases with increasing H_2 content. Another interesting development was that subsequent experimental runs on the same ZrH_4 sample indicated an increasingly greater thermal expansion. The explanation for this phenomenon is not certain but is believed to be either an annealing effect or possibly a result of contamination from dilatometer outgassing, probably a combination of both. (Author)

PB 155 353 $3.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
NONLINEAR EFFECTS IN THERMAL CONVECTION, by F. E. Bisshopp. Scientific rept. no. 3 on Contract AF 19(604)7236. Mar 61, 37p. 8 refs. AFCRL-269; AD-253 030.

DESCRIPTORS: *Convection, *Heat, Liquids, Perturbation theory, Fourier analysis.

The nonlinear equations governing thermally induced convective motions in a plane liquid layer are examined. Under the assumption that steady motions take place within an array of closed cells which are characterized by a single wave-number, formal solutions of the governing equations can be generated by means of regular perturbation theory. The perturbation theory is carried to second order in a quantity A which is essentially the maximum vertical velocity of the fluid, and formal expressions, applicable for any combination of rigid and free bounding planes, for corrections to the solutions predicted by the linearized equations are given. Explicit evaluations of the corrections are carried out in the simple case where both bounding planes are free, and an investigation of the stability of the resulting solutions is made. Modes of motion described by wave-numbers in a neighborhood of the one initially assumed are excited, regardless of how the initial wave-number was chosen. The apparent contradiction indicates that a Fourier analysis of finite-amplitude convective motions should include a continuous spectrum of wave-numbers. (Author)

PB 148 973 $2.60

Connecticut U., Storrs.
TRANSPORT PROPERTIES OF HELIUM II IN FINE CHANNELS, by J. Burnham, J. Reppy and others. Technical rept. no. 1 on Contract Nonr-2967(00). [1960] 24p. 17 refs. AD-239 477.

DESCRIPTORS: *Transport properties, *Helium, *Liquefied gases, *Heat transfer, Measurement, Resistance thermometers, Viscosity, Thermal diffusion.

The thermal conductivity of liquid helium II in the interstices of a column of packed jeweler's rouge (Fe_2O_3 powder) has a temperature dependence: $k \alpha T^n$, where n falls monotonically from a value of 13 at 1.5°K to possible zero at the lambda point. The value of the thermal conductivity at the lambda point is 0.60 ± .03 watts/cm°K. From the flow of helium, nitrogen, and water at room temperature, a typical rouge column provides the equivalent of about 1.4×10^9 parallel channels having an average diameter of 0.18 ± .02 μ. The viscosity of the normal component of helium II, computed from the measured conductivity on the basis of the 2-fluid model, follows a temperature dependence very similar to that observed for the bulk liquid and for 52- and 108-μ capillaries above 1.9°K. The magnitude of the values, however, is lower, but in agreement with that obtained with 0.7-μ slits. Empirical values of a correcting slip coefficient are smaller in magnitude (0.007 μ) and less temperature dependent (- 0.018 μ/°K) than theoretical values calculated. Points on the lambda line were determined from the fountain effect for pressures below 0.4 atm. The slope of the line is about - 70 atm/°K, in agreement with the slope determined at higher pressures by other means. (Author)

PB 150 995 $1.60

Institute of Flight Structures, Columbia U., New York.
ON THE SOLUTION OF HEAT CONDUCTION PROBLEMS IN A MELTING SOLID, by Bruno A. Boley. Technical rept. no. 17 on Contract Nonr-266(20). July 60, 15p. 8 refs. CU-17-60-ONR-266(20)-CE; AD-244 799.

DESCRIPTORS: *Heat transfer, *Heating, *Melting, Solids, Integral equations, Differential equations, Mathematical analysis.

A method of solution of the problem of heat conduction in a melting solid is presented. The melted portion is assumed to be immediately removed as it forms. The essential feature of the method consists in dealing mathematically with a fictitious solid of constant dimensions under an equivalent unknown heat input. This results in an ordinary integro-differential problem, which can be readily solved numerically or in series form. Comparisons with the known solution for a semi-infinite solid are carried out. (Author)

PB 154 148 $1.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
HEAT TRANSFER IN LOW-PRANDTL-NUMBER FLOWS WITH VARIABLE PROPERTIES, by D. K. Edwards and D. M. Tellep. Technical rept. on Flight Sciences. Sep 60, 19p. 3 refs. LMSD-703093; AD-243 790.

DESCRIPTORS: *Heat transfer, Differential equations, Fluid flow, *Liquid metals, Theory.

Heat transfer in variable property flows is studied in the limiting case of Prandtl number approaching zero. The conservation equations are therefore reduced to a single nonlinear ordinary differential equation, the solution of which is shown to be self-similar when thermal properties are expressed by simple power-law fits. Significant thermal property variations across the thermal layer are shown to have a relatively small effect on heat transfer. (Author)

(Physics--Thermodynamics, 15 July 61)

PB 154 145 $5.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
STRESSES AND DEFLECTIONS DUE TO AXIAL TEMPERATURE DISTRIBUTION IN THIN CYLINDRICAL SHELLS, by J. R. Hutchinson. Technical memo. on Flight Sciences. Sep 60, 57p. 3 refs. LMSD-703071; AD-243 791.

DESCRIPTORS: *Cylindrical bodies, Structural shells, *Stresses, Temperature, Thermal stresses, Deflection, Differential equations, Matrix calculus, Guided missiles.

Several causes of axial temperature differences are investigated as a means of determining the types of temperature distribution which might be expected in a cylinder. The distributions determined are for the steady-state condition of a cylinder, with one end held at a constant temperature and the other end either insulated or held at a different temperature, and with heat loss along the length of the cylinder being either convective or radiative. The condition of convective heat loss along the cylinder gives temperature distributions which can be expressed in analytic form, but the radiative condition gives distributions which must be determined numerically except in special cases, one of which reduces to the same form as the convective condition. Also shown are methods of determinin the stresses and deflections in both long and short cylinders when the temperature distribution is given as an analytic function of the length. In particular, the analytic functions found for convective cooling are considered; however, the methods hold equally well for any analytic temperature distribution. A numerical method of solving for stresses and deflections is developed for cases where the temperature distribution is given as a numerical or graphical function of the length, as in the case of radiative heat transfer. This method is expressed in matrix form so that it can be programmed easily for a digital computer. (Author)

PB 149 842 $1.60

Materials Research Lab., U. of California, Berkeley.
HEAT CAPACITY OF LIQUID BISMUTH, by Howard Bell (Master's thesis) and Ralph Hultgren. Technical rept. no. 1 on Contract Nonr-222(63). 1 July 60, 18p. 23 refs. Series no. 155, issue no. 1; AD-242 469.

DESCRIPTORS: *Bismuth, *Liquid metals, Specific heat, Heat transfer, Thermodynamics, Reactor coolants.

The true heat capacity of liquid bismuth was measured from within three tenths of a degree of the melting point (544.5°K) to 801.8°K by a method of mixtures using a liquid bismuth calorimeter. The results show a decrease in heat capacity with increasing temperature. This is in agreement with a trend which has been observed for the heat capacities of other liquid metals. The results of the investigation are discussed in relation to the structure of the liquid. The following conclusions are reached: (1) The anomalously high heat capacity within a few degrees of the melting point can be accounted for by assuming the presence of residual aggregates resembling the solid which are broken up with rising temperature. (2) The heat capacity of liquid bismuth decreases with increasing temperatures over the range studied. (3) No minimum in Cp was observed although one may exist at a higher temperature. (Author)

PB 154 354 $3.60

Space Sciences Lab., General Electric Co. [Philadelphia, Pa.]
HIGH TEMPERATURE SPECTRAL EMISSIVITY STUDIES, by Thomas R. Riethof. Rept. on Contracts AF 04(647)269 and AF 33(616)684. Jan 61, 37p. 16 refs. Technical Information Series R61SD004; AD-250 274.

DESCRIPTORS: *Thermal radiation, Measurement, *High temperature research, Solids, Test facilities.

The techniques and experimental apparatus used in the measurement of normal, spectral emissivities of opaque solids at high temperatures are discussed. Results of representative recent measurements are presented and compared with some of the work carried on at the Space Sciences Laboratory. The relative merits of various experimental techniques are discussed in light of the experimental difficulties involved. (Author)

PB 156 094 $6.60

[Space Sciences Lab.] General Electric Co., Philadelphia, Pa.
SURVEY OF THEORETICAL AND EXPERIMENTAL DETERMINATIONS OF SKIN FRICTION IN COMPRESSIBLE BOUNDARY LAYERS. IV. THE TURBULENT BOUNDARY LAYER WITH AXIAL VARIATION OF PRESSURE AND SURFACE TEMPERATURE, by D. E. Nestler. Rept. no. 4 on Literature Survey of Thermodynamic Problem and Analysis Material, Contract AF 04(647)269. 1 June 59, 69p. 35 refs. Technical Information Series R59SD340.

This report released for sale to the public 1 June 61. DESCRIPTORS: *Turbulent boundary layer, Heat transfer, Surfaces, Friction, Temperature, Pressure, Bibliography.

The results of a survey of methods of predicting skin friction for turbulent boundary layers are reported for surfaces having axial variation of local stream pressure and surface temperature. Several methods are reviewed critically, and compared quantitatively for a hemisphere-cylinder body at typical missile free-stream flight conditions. The Eckert reference temperature method is recommended tentatively for its simplicity, because it agreed reasonably well with more complicated methods. It is noted that no experimental skin friction data are available to verify the theoretical methods. (Author)

Wave Propagation

ARF-4132-12 $2.25

Armour Research Foundation, Chicago, Ill.
PROPAGATION OF PRESSURE WAVES IN A MIXTURE OF WATER AND STEAM, by H. B. Karplus. Rept. on Contract AT(11-1)-528. Jan 61, 89p.

PB 155 205 $1.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
WAVE PROPAGATION IN A MEDIUM WITH A MOVING SINUSOIDAL DISTURBANCE, by A. Hessel and A. A. Oliner. Rept. on Contract AF 19(604)2031. 17 Nov 60, 18p. 9 refs. Research rept. PIBMRI-880-60; AFCRL-102; AD-252 692.

DESCRIPTORS: *Electromagnetic waves, *Wave transmission, Propagation, Wave analysis, Dielectric properties.

A recent paper by Simon derives approximate results, employing only three space harmonics, for the propagation characteristics of an electromagnetic wave traveling in a medium possessing a progressive sinusoidal disturbance. A rigorous result is presented here for this same problem, taking into account all of the space harmonics, and a sufficiency condition for the convergence of this solution is discussed. This sufficiency condition is not satisfied in a particular case treated by Simon, and it is shown that his analysis of this case is in error, and that the total field is singular there. The singular nature of the field is associated with "supersonic" effects in the medium containing the progressive disturbance. (Author)

PB 154 193 $4.60

Radiation Lab., U. of Michigan, Ann Arbor.
STUDIES IN RADAR CROSS SECTIONS. 42. ON MICROWAVE BREMSSTRAHLUNG FROM A COOL PLASMA, by M. L. Barasch. Rept. on Contract DA 36-039-sc-75041. Aug 60, 48p. 9 refs. 2764-3-T; ARPA Order no. 120-60; AD-245 070.

DESCRIPTORS: *Radar echo areas, Mathematical analysis, Electromagnetic waves, *Bremsstrahlung, Plasma physics, Electrons.

Microwave Bremsstrahlung from, and free-free absorption in, a cool, partially-ionized plasma are treated. Electron-ion encounters are treated by the Born approximation and the classical impulse approximation, a Debye-shielded potential being used. Bremsstrahlung from electron-neutral collisions is treated by the Born approximation. The potential here is obtained by fitting a shielded Coulomb form to the Thomas-Fermi potential for distances less than about 7 atomic radii. For the plasma parameters chosen ($T = 5000^{o}K$, $n_e = 10^{13}/cm^3$, $Z = 8$) and microwave frequencies of the order of 50 kmc, it would appear that at the correspondingly low degree of ionization, the neutrals are most significant. An effective Z for the oxygen atoms is determined by matching the free-free absorption to Kramers' law. Its value, $Z = .17$, compares reasonably with the results of previous investigators. (Author)

PB 155 352 $10.50

Radiation Lab., U. of Michigan, Ann Arbor.
STUDIES IN RADAR CROSS SECTIONS. 44 INTEGRAL REPRESENTATIONS OF SOLUTIONS OF THE HELMHOLTZ EQUATION WITH APPLICATION TO DIFFRACTION BY A STRIP, by R. E. Kleinman (Doctoral thesis) and R. Timman. Scientific rept. no. 3 on Contract AF 19(604)6655. Feb 61, 132p. 34 refs. 3648-3-T; AFCRL-65; AD-253 052.

DESCRIPTORS: *Diffraction, *Radar echo areas, *Wave analysis, *Integrals, Partial differential equations, Integral equations, *Electromagnetic waves.

A class of solutions is derived of the two dimensional Helmholtz equation which satisfied particularly simple boundary conditions. These were used to construct a double integral equation for the Green's function for a line segment. When the line segment was infinite a double integral representation was obtained of the difference of two Hankel functions (line sources). For the case when the line was semi-infinite the known result for the Green's function was used to obtain, via the integral equation, an integral representation for this same Green's function. This integral form, when properly interpreted, led to the corresponding form for the Green's function for a finite segment and this assertion was verified. (Author)

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

PB 149 793 $6.60

Computation Center; Carnegie Inst. of Tech., Pittsburgh, Pa.
ON THE SYNTAX MACHINE AND THE CONSTRUCTION OF A UNIVERSAL COMPILER, by A. E. Glennie. Technical rept. no. 2 on Contract Nonr-760(18). 10 July 60, 67p. 1 ref. AD-240 512.

DESCRIPTORS: *Language, *Machine translation, Digital computers, Programming.

The problem of many problem-oriented languages to be translated to many machine languages is considered. A mechanism for scanning a linear text and performing a syntactic analysis is proposed. A pseudo-machine, the syntax machine, whose programs may be considered to define the language of the text, is described. The output from the syntax machine is a string whose evolution leads to a (partial) translation of the source text. The application of the syntax machine to translation for a particular target-machine language is discussed, and how the syntax description may be written to exploit the special feature of the target machine is shown. Consideration is given to the role of declarations in the source language and the mechanisms required to effect them in the translation process. A supplementary process of assembly required to evaluate the strings produced by the syntax machine is investigated.

PB 161 671 $3.00

Diamond Ordnance Fuze Labs., Washington, D. C.
MEASUREMENT OF DISPLACEMENT, VELOCITY, AND ACCELERATION: BIBLIOGRAPHY WITH ABSTRACTS AND INDEX, by Joseph Pearlstein. 22 Aug 60, 185p. 655 refs. Technical rept. TR-836; AD-243 420.

DESCRIPTORS: *Instrumentation, Measurement, *Acceleration, *Velocity, *Bibliography, Mechanics, *Transducers, *Laboratory equipment.

An annotated bibliography was compiled using literature references from 1950 to 1958 dealing with the measurement, including detection, sensing, and control, of displacement, velocity, and acceleration. The references are arranged alphabetically according to the name of the principal author. For each reference an effort is made to identify the source and date of the original material. The references are grouped under the 3 separate headings and are numbered consecutively from 1 to 655 without regard to grouping under the headings. Concomitant measurands treated in the publication are indicated at the end of each reference. In the index the 3 major headings are listed, under which are given terms listed alphabetically from the peek-a-boo system and associated with each reference under 1 or more of 10 principal categories used in the peek-a-boo system.

PB 154 943 $5.60

Haloid [Xerox, Inc.] Rochester, N. Y.
CONTINUOUS-TONE ELECTROSTATIC ELECTROPHOTOGRAPHY, by P. G. Andrus, L. E. Walkup and others. Final rept. for 15 Feb 57-15 Feb 58 on Contract DA 36-039-sc-73141. 15 Feb 58, 55p. AD-162 009.

DESCRIPTORS: *Electrostatics, *Electrophotography, *Photographic plates, Preparation, *Photographs.

This research was directed toward specifications for an experimental prototype continuous-tone xerographic printer. It was required that specific process problems should be solved. These involved the complex of print transfer and plate cleaning. A fundamental study built upon a model of the transfer operation brought practical insight into that operation. Two practical systems for electrostatic transfer were evolved. The study of brush cleaning has led to a new improved technique. An advanced new system for powder-cloud development has been established. Machine specifications can be made now for an experimental continuous-tone xerographic processor, and programs leading to development-model design have been prepared. (Author)

PB 155 356 $1.60

Indiana U., Bloomington.
THE AUTOMATION OF GENERAL SEMANTICS, by F. W. Householder, Jr. and J. Lyons. Quarterly rept. no. 4, 1 Dec 60-28 Feb 61, on Contract AF 30(602)2185; continuation of Contract AF 30(602)2184. 15 Mar 61, 11p. AD-253 274.

DESCRIPTORS: *Language, *Digital computers, *Data processing systems, Automation, Dictionaries, Programming, Punched card method.

Contents:
Key-punching and sorting of the preliminary corpus
Dictionary look-up
Inflectional and derivational affixes
Walker's rhyming dictionary
(See also PB 153 805)

SOCIAL SCIENCES

PB 149 524 $1.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
NEUTRAL INVENTIONS AND THE STABILITY OF GROWTH EQUILIBRIUM, by Hirofumi Uzawa. Technical rept. no. 86 on Contract Nonr-225(50). 1 July 60, 15p. 10 refs. AD-240 161.

DESCRIPTORS: *Inventions, *Economic conditions, Classification, Mathematical analysis.

A study is presented of neutral inventions primarily intended for applications to the problem of economic growth. The proposition of Robinson for neutral inventions (Rev. of Econ. Stud. 5:139-149, 1937-38) is formulated, and those inventions that are neutral in Harrod's sense are characterized analytically. According to Harrod, a technical invention is defined as neutral if at a constant rate of interest it does not disturb the value of the capital coefficient. A neoclassical growth model with neutral inventions in Harrod's sense is considered, and the stability of the growth equilibrium in such a model is proved. The aggregate production function underlying the model is assumed only to be subject to constant returns to scale and to diminishing marginal rates of substitution.

PB 149 801 $10.50

Applied Mathematics and Statistics Labs., Stanford U., Calif.
STEADY STATE PROPERTIES OF SELECTED INVENTORY MODELS, by Richard C. Singleton. Technical rept. no. 23 on Contract Nonr-225(28). 21 July 60, 137p. 6 refs. AD-240 461.

DESCRIPTORS: Supplies, *Scheduling, Mathematical analysis, Production, Probability.

Known techniques of analysis are applied to the investigation of a group of mathematical models related to the problem of inventory control. Three models, based on a common demand and resupply structure, but differing in their stock policies, are discussed: (1) the stocking point accepts delivery whenever available, subject to a fixed storage capacity limitation; (2) the stocking point accepts the full available delivery if the stock level is below a fixed level s, and otherwise rejects delivery; and (3) the stocking policy accepts an available delivery subject to a storage capacity limitation S when the stock is below s, where $s \leq S$, and otherwise rejects delivery. These models are then extended to the case where the distribution of available delivery quantity depends on the number of periods since the last delivery. The problem of controlling stock levels at n stocking points is discussed. A single stocking point model is considered in which the random quantity of resupply is assumed to be available for regular delivery each period.

PB 154 995 $4.60

Columbia U., New York.
ANTICIPATED ALIGNMENTS OF NATIONS IN THE COLD WAR, by Jiri Nehnevajsa. Rept. on Research or Comparative Impact of Actual Versus Anticipated Events, Proj. Outcomes, Contract AF 49(638)743. 20 Jan 61, 48p. AFOSR-92; AD-251 732

DESCRIPTORS: *Sociology, Theory, Reasoning, *Political science, Communism, *Attitudes, Probability, Test methods, Public opinion, Statistical analysis, *Foreign policy, Behavior.

Propensities on the part of nations to shift from one major ideological posture into another one are analyzed. Specifically, some nations might become Communistic in the future either by force or voluntarily. Communist nations may accept democratic governmental models; or they may adapt Communism to their nationalistic strivigns; or these may be anti-Communist rebellions. Brazilian and Finnish respondents were interviewed about general likelihood of these outcomes; about their desirability; about the likelihood and desirability of such changes in the United States and their own country on one hand, and in the Soviet Union and China on the other hand. The subjects were then provided with alternative lists of nations to state which ones of the countries cited might change in any one of the ways considered. The findings are presented and discussed. (Author)

PB 150 192 $6.60

Hebrew U. (Israel).
ON FORMAL PROPERTIES OF SIMPLE PHRASE STRUCTURE GRAMMARS, by Y. Bar-Hillel, M. Perles, and E. Shamir. Technical rept. no. 4 on Contract N62558-2214. 8 July 60, 61p. 8 refs. AD-241 572.

DESCRIPTORS: *Language, *Mathematical logic, Theory, Applied mathematics.

Mathematical problems are presented concerning simple phrase structure grammars (SPGs). The problems studied include: representations of SPGs, relations with other formal systems (in particular with finite automata), characterizations of the language obtainable by SPGs, closure under Boolean operations and decision problems for various properties of SPGs. (Author).

PB 149 077 $1.60

Institute for Cooperative Research, U. of Pennsylvania, Philadelphia.
SOME SUGGESTED MECHANIZED INDEXING INVESTIGATIONS WHICH REQUIRE NO MACHINES, by John O'Connor. Rept. on [Contract Nonr-551(35)]. [1960] 19p. 13 refs. AD-240 040.

DESCRIPTORS: *Indexes, Automation, *Documentation.

An investigation was made concerning the possibilities of mechanized indexing which would not require machines. The equipment required for the investigations is a vocabulary of indexing terms, and a document collection to which they have been applied and are being used for retrieval. Some rules were postulated for the selection and assignment of terms. The under-assigning and over-assigning of terms was discussed at length.

MISCELLANEOUS

PB 171 319 $1.25, $10.00/year

Naval Research Lab., Washington, D. C.
REPORT OF NRL PROGRESS. June 61.

DESCRIPTORS: Naval research, Scientific research.

Contents:
Articles:
Rocket Observations of Lyman-alpha Radiation in the Night Sky, by D. C. Morton and J. D. Purcell
Production and Measurement of Plasma Temperatures in the 10,000,000°K Range, by A. C. Kolb
Reaction of Electronic Components to a High-Pressure, Hydrostatic Environment, by C. L. Buchanan
Scientific program:
Applications Research: Orbit computer for a satellite position display
Chemistry: Adsorption of oil-soluble sulfonates at the metal-oil interface. Application of X-Y pulsed measuring system to polarization studies: the hydrogen reaction on platinum

Mechanics: Thermodynamic analysis of an NRL light gas gun performed with NAREC

Metallurgy and Ceramics: Vapor transport in the oxidation of iron-chromium alloys. Anomalous fracture in the creep of nickel. Kinetics of the formation of niobium-zinc compounds on niobium in zinc vapor. Zinc vapor coating of binary niobium alloys. Low cycle fatigue. Temperature dependence of plane strain crack toughness of a high-strength steel significance of energy absorption to shear failure

Nuclear and Atomic Physics: Comparison of neutron beams from a radial beam port and from the tangential port of the NRL reactor as sources of neutron-capture gamma rays. Gamma-ray scanning techniques for fast breeder reactor safety studies

Optics: High-resolution investigation of the relative spectral attenuation coefficients of water

Radio: Automatic radio teleprinters. Equations for bistable doppler shift and rate of change of doppler shift of dark satellite observations. "Drop" refractometer employed in Project Trade Winds III study of meteorological phenomena and their effects upon radio transmission. Phase stable synthesizer for controlling vlf transmitters. New technique for accurately timing the plate carriage position of a photographic zenith telescope

Solid State Physics: Electron paramagnetic resonance in irradiated CsCl. Specific heat of a particle in a box. Anomalous specific heat of disordered solids. A high vacuum device for studying the luminescence from solids. Determination of the configurational coordinate of a luminescent center

Sound: Reaction of semiconductors to hydrostatic pressure. Depth position of an underwater cable-towed body

Supporting Techniques: Producing 0.0012-inch slits in metal specimens

A D INDEX

AD No.	Div.
256 000	6
256 001	8
256 002	2
256 004	20
256 005	30
256 007	20
256 008	20
256 009	20
256 010	22
256 011	2
256 012	25
256 013	15
256 014	15
256 015	15
256 016	15
256 017	15
256 019	9
256 020	25
256 021	7
256 025	12
256 026	10
256 027	9
256 028	9
256 029	9
256 030	16
256 031	25
256 035	26
256 036	28
256 037	28
256 038	15
256 039	28
256 040	16
256 041	14
256 045	15
256 046	15
256 048	9
256 049	2
256 050	17
256 051	10
256 052	22
256 053	15
256 054	15
256 055	8
256 056	2
256 057	25
256 060	25
256 061	1
256 062	2
256 064	27
256 065	20
256 066	25
256 068	8
256 071	12
256 073	1
256 074	1
256 075	17
256 076	9
256 077	9
256 078	9
256 079	2
256 080	9
256 081	20
256 082	8
256 087	2
256 088	2
256 089	2
256 090	25
256 091	8
256 092	17
256 093	2
256 094	17
256 095	17
256 096	4
256 097	25
256 098	4
256 099	8
256 100	17
256 101	8
256 102	26
256 103	30
256 104	23
256 105	20
256 106	1
256 107	12
256 108	25
256 109	26
256 110	14
256 111	14
256 112	8
256 113	26
256 114	17
256 115	17
256 116	25
256 117	17
256 118	30
256 119	17
256 120	17
256 121	17
256 122	17
256 123	26
256 124	17
256 125	26
256 126	26
256 127	10
256 128	4
256 129	25
256 130	17
256 131	25
256 132	17
256 133	10
256 134	26
256 135	4
256 136	26
256 137	25
256 138	17
256 139	17
256 141	26
256 142	26
256 143	26
256 144	25
256 145	16
256 146	14
256 147	26
256 148	26
256 149	17
256 150	4
256 151	17
256 152	17
256 153	25
256 154	17
256 155	17
256 156	17
256 157	26
256 158	16
256 159	10
256 160	30
256 161	2
256 162	2
256 163	30
256 165	12
256 166	25
256 167	17
256 168	26
256 169	16
256 170	9
256 171	9
256 172	9
256 173	9
256 174	9
256 175	9
256 176	9
256 177	9
256 178	9
256 179	9
256 180	9
256 181	9
256 182	9
256 183	9
256 184	9
256 185	9
256 186	9
256 187	9
256 190	17
256 191	30
256 192	20
256 193	4
256 194	20
256 203	22
256 204	17
256 205	30
256 206	17
256 208	14
256 209	23
256 210	17
256 211	9
256 212	8
256 213	8
256 214	26
256 215	15
256 216	25
256 217	15
256 218	14
256 219	32
256 220	26
256 221	8
256 222	8
256 223	8
256 224	26
256 225	26
256 226	26
256 227	15
256 228	8
256 230	25
256 233	14
256 234	9
256 235	16
256 236	12
256 237	2
256 238	6
256 239	9
256 240	10
256 241	8
256 242	16
256 243	8
256 244	25
256 245	15
256 246	2
256 257	18
256 258	30
256 259	14
256 260	16
256 261	16
256 262	25
256 263	30
256 264	30
256 265	4
256 266	12
256 267	25
256 268	25
256 269	13
256 271	20
256 272	25
256 273	25
256 274	9
256 275	4
256 277	8
256 278	22
256 279	8
256 280	4
256 281	8
256 282	25
256 283	10
256 284	15
256 285	15
256 286	4
256 294	16
256 306	25
256 307	12
256 309	17
256 310	20
256 311	2
256 313	28
256 314	7
256 315	13
256 318	22
256 319	22
256 320	12
256 321	12
256 322	3
256 324	3
256 325	3
256 326	3
256 327	8
256 328	9
256 329	8
256 332	18
256 333	30
256 334	16
256 336	22
256 338	22
256 339	8
256 340	25
256 342	23
256 345	14
256 346	23
256 347	9
256 350	16
256 351	4
256 352	12
256 353	15
256 354	20
256 355	30
256 356	16
256 357	6
256 359	12
256 360	2
256 361	28
256 363	15
256 364	16
256 365	4
256 366	4
256 367	4
256 368	20
256 369	22
256 370	15
256 371	30
256 373	16
256 374	27
256 375	30
256 376	26
256 378	16
256 379	32
256 380	31
256 381	13
256 383	28
256 384	16
256 389	4
256 390	8
256 393	16
256 394	16
256 395	16
256 396	16
256 397	16
256 398	16
256 399	16
256 400	10
256 401	30
256 402	6
256 403	25
256 404	4
256 405	4
256 406	16

AD No.	Div.
256 407	4
256 411	22
256 412	7
256 413	8
256 414	14
256 416	16
256 417	16
256 419	8
256 420	4
256 421	8
256 422	2
256 426	1
256 442	42
256 443	45
256 451	2
256 452	2
256 453	8
256 454	32
256 455	1
256 456	45
256 457	45
256 458	45
256 461	27
256 462	10
256 464	22
256 465	26
256 469	32
256 470	8
256 471	46
256 476	1
256 477	8
256 478	8
256 479	45
256 480	24
256 481	25
256 482	20
256 483	26
256 484	26
256 485	7
256 488	28
256 489	45
256 491	8
256 492	12
256 493	12
256 495	25
256 496	17
256 497	15
256 499	25
256 500	16
256 503	20
256 504	14
256 505	1
256 506	17
256 507	9
256 508	9
256 509	12
256 510	1
256 511	20
256 512	25
256 513	27
256 515	9
256 516	6
256 523	32
256 524	6
256 525	2
256 528	45
256 530	18
256 531	1
256 532	1
256 533	1
256 539	8
256 540	8
256 541	31
256 544	8
256 545	8
256 546	12
256 547	15
256 548	6
256 549	25

AD No.	Div.
256 550	20
256 551	20
256 552	20
256 553	20
256 554	8
256 557	8
256 559	6
256 560	18
256 564	46
256 565	8
256 568	8
256 569	8
256 570	8
256 571	22
256 579	7
256 580	7
256 581	7
256 582	48
256 584	5
256 585	16
256 586	8
256 587	6
256 588	45
256 589	8
256 593	42
256 594	12
256 598	25
256 599	14
256 600	47
256 605	2
256 606	2
256 607	10
256 608	17
256 609	10
256 610	17
256 611	8
256 612	12
256 613	4
256 614	25
256 615	8
256 616	25
256 617	4
256 618	25
256 619	47
256 622	22
256 623	4
256 624	15
256 625	28
256 626	22
256 629	25
256 630	25
256 631	25
256 632	8
256 633	17
256 634	42
256 635	25
256 636	5
256 638	16
256 644	28
256 645	25
256 648	6
256 649	46
256 651	25
256 652	25
256 653	8
256 654	25
256 655	25
256 656	16
256 657	46
256 658	17
256 659	4
256 660	16
256 661	25
256 662	15
256 663	15
256 664	25
256 665	32
256 666	2
256 667	15

AD No.	Div.
256 668	
256 669	15
256 670	15
256 671	15
256 672	8
256 673	25
256 674	25
256 675	8
256 676	25
256 677	14
256 678	10
256 679	15
256 688	10
256 689	14
256 690	25
256 691	8
256 692	8
256 693	8
256 694	8
256 695	8
256 699	25
256 701	7
256 702	7
256 704	5
256 705	25
256 708	16
256 709	4
256 710	8
256 711	1
256 714	8
256 715	8
256 716	8
256 727	16
256 734	16
256 736	1
256 737	30
256 738	22
256 739	25
256 740	12
256 741	8
256 742	13
256 743	20
256 744	14
256 745	9
256 746	8
256 748	7
256 750	8
256 751	4
256 752	6
256 753	8
256 754	8
256 755	7
256 756	5
256 757	5
256 758	10
256 759	14
256 761	15
256 762	8
256 763	25
256 764	25
256 765	25
256 766	4
256 767	17
256 768	8
256 769	30
256 770	30
256 771	9
256 772	1
256 773	1
256 774	8
256 775	8
256 776	8
256 777	9
256 778	22
256 779	9
256 780	15
256 781	15
256 782	15
256 783	15

AD No.	Div.
256 784	15
256 785	7
256 786	17
256 787	10
256 788	8
256 789	14
256 790	26
256 791	1
256 792	21
256 793	26
256 794	16
256 795	16
256 796	16
256 797	25
256 798	17
256 799	17
256 800	28
256 801	25
256 803	25
256 804	13
256 805	16
256 806	16
256 807	20
256 808	16
256 809	25
256 810	13
256 811	4
256 812	7
256 813	30
256 814	8
256 815	11
256 816	28
256 818	1
256 819	22
256 851	1
256 852	26
256 853	8
256 854	8
256 855	8
256 857	9
256 858	8
256 859	16
256 860	31
256 862	29
256 864	17
256 865	15
256 866	19
256 867	2
256 868	8
256 869	8
256 870	4
256 871	12
256 872	32
256 873	1
256 874	1
256 875	14
256 876	8
256 877	16
256 878	28
256 879	17
256 880	26
256 881	7
256 882	7
256 883	8
256 884	20
256 885	20
256 886	15
256 887	4
256 889	25
256 890	30
256 891	28
256 892	9
256 894	25
256 895	30
256 896	8
256 897	3
256 899	2

NUMBER INDEX

Number	Page
AAL-TN-60-16	S-6
AAL-TN-60-17	S-5
AAL-TN-60-28	S-3
AAL-TR-59-16	S-7
AAL-TR-59-20	S-7
AAL-TR-59-21	S-8
AAL-TR-60-1	S-8
AAL-TR-60-8	S-23
AAL-TR-60-17	S-8
AAL-TR-60-40	S-6
AD-105 971	S-43
AD-120 064	S-39
AD-131 788	S-76
AD-135 665	S-40
AD-137 955	S-26
AD-144 911	S-10
AD-148 803	S-25
AD-149 502	S-14
AD-156 059	S-40
AD-157 793	S-40
AD-159 751	S-26
AD-162 009	S-79
AD-201-547	S-68
AD-201-828	S-28
AD-202 149	S-56
AD-204 156	S-31
AD-204 230	S-31
AD-205 337	S-30
AD-206 112	S-69
AD-207 007	S-29
AD-207 009	S-52
AD-208 307	S-27
AD-209 923	S-33
AD-210 781	S-26
AD-211 436	S-35
AD-212 370	S-31
AD-212 696	S-69
AD-212 698	S-69
AD-212 700	S-70
AD-212 717 superseded	S-35
AD-212 742	S-69
AD-213 585	S-18
AD-214 121	S-70
AD-214 500	S-31
AD-214 626	S-30
AD-214 693	S-7
AD-215 030	S-51
AD-215 261	S-8
AD-216 347	S-13
AD-217 676	S-25
AD-217 830	S-45
AD-218 043	S-72
AD-218 931	S-72
AD-219 398	S-45
AD-220 479	S-14
AD-220 516	S-13
AD-221 503	S-47
AD-225 538	S-35
AD-226 322	S-7
AD-226 551	S-45
AD-226 753	S-4
AD-226 756	S-6
AD-227 059	S-4
AD-227 075	S-51
AD-230 378	S-5
AD-231 260	S-25
AD-231 269	S-67
AD-232 111	S-65
AD-232 899	S-62
AD-233 133	S-58
AD-233 136	S-43
AD-233 170	S-6
AD-233 298	S-47
AD-233 349	S-38
AD-234 031	S-50
AD-234 123	S-72
AD-234 858	S-10
AD-234 859	S-11
AD-235 242	S-9
AD-236 223	S-59
AD-236 250	S-35
AD-236 279	S-2
AD-237 912	S-59
AD-239 162	S-11
AD-239 245	S-46
AD-239 342	S-74
AD-239 382	S-1
AD-239 477	S-76
AD-239 506	S-3
AD-239 520	S-4
AD-239 568	S-18
AD-239 644	S-42
AD-239 721	S-47
AD-239 968	S-11
AD-239 982	S-60
AD-240 040	S-80
AD-240 048	S-13
AD-240 049	S-18
AD-240 061	S-64
AD-240 075	S-18
AD-240 078	S-73
AD-240 127	S-15
AD-240 161	S-79
AD-240 195	S-34
AD-240 248	S-67
AD-240 321	S-19
AD-240 340	S-24
AD-240 388	S-54
AD-240 420	S-64
AD-240 426	S-24
AD-240 429	S-44
AD-240 461	S-80
AD-240 478	S-43
AD-240 500	S-66
AD-240 502	S-66
AD-240 506	S-18
AD-240 512	S-78
AD-240 577	S-17
AD-240 605	S-19
AD-240 621	S-20
AD-240 690	S-19
AD-240 708	S-53
AD-240 847	S-38
AD-240 885	S-36
AD-240 926	S-44
AD-241 063	S-70
AD-241 140	S-5
AD-241 159	S-45
AD-241 161	S-12
AD-241 163	S-34
AD-241 165	S-5
AD-241 169	S-3
AD-241 230	S-13
AD-241 392	S-46
AD-241 422	S-14
AD-241 460	S-14
AD-241 572	S-80
AD-241 645	S-48
AD-241 683	S-44
AD-241 700	S-66
AD-241 727	S-45
AD-241 752	S-70
AD-241 907	S-63
AD-242 204	S-24
AD-242 224	S-10
AD-242 251	S-26
AD-242 368	S-45
AD-242 407	S-41
AD-242 453	S-67
AD-242 458	S-15
AD-242 469	S-77
AD-242 548	S-27
AD-242 549	S-27
AD-242 617	S-4
AD-242 720	S-19
AD-242 743	S-34
AD-242 794	S-63
AD-242 864	S-53
AD-242 984	S-71
AD-243 104	S-71
AD-243 155	S-28
AD-243 265	S-48
AD-243 411	S-8
AD-243 420	S-79
AD-243 455	S-57
AD-243 725	S-27
AD-243 726	S-28
AD-243 790	S-77
AD-243 791	S-77
AD-243 856	S-36
AD-243 972	S-2
AD-244 061	S-27
AD-244 162	S-54
AD-244 491	S-72
AD-244 593	S-30
AD-244 667	S-58
AD-244 671	S-52
AD-244 680	S-36
AD-244 799	S-76
AD-245 070	S-78
AD-245 477	S-31
AD-245 522	S-4
AD-245 602	S-62
AD-245 662	S-25
AD-246 021	S-63
AD-246 550	S-1
AD-246 637	S-64
AD-246 638	S-75
AD-246 639	S-64
AD-246 640	S-52
AD-248 730	S-12
AD-248 991	S-75
AD-249 246	S-75
AD-249 257	S-60
AD-249 330	S-2
AD-249 331	S-2
AD-249 332	S-3
AD-249 341	S-65
AD-249 418	S-23
AD-249 421	S-50
AD-249 438	S-71
AD-249 468	S-30
AD-249 479	S-16
AD-249 542	S-41
AD-249 544	S-65
AD-249 574	S-17
AD-249 575	S-17
AD-249 638	S-29
AD-249 656	S-5
AD-249 657	S-23
AD-249 677	S-37
AD-249 706	S-38
AD-249 709	S-42
AD-249 738	S-42
AD-249 794	S-8
AD-249 795	S-8
AD-249 798	S-6
AD-249 813	S-46
AD-249 825	S-12
AD-249 828	S-37
AD-249 846	S-74
AD-249 875	S-57
AD-249 883	S-60
AD-249 885	S-62
AD-249 884	S-62
AD-249 886	S-60
AD-249 908	S-38
AD-250 057	S-35
AD-250 129	S-21
AD-250 196	S-16
AD-250 210	S-32
AD-250 254	S-75
AD-250 274	S-77
AD-250 499	S-21
AD-250 551	S-33
AD-250 584	S-16
AD-250 760	S-2
AD-250 862	S-43
AD-250 863	S-17
AD-250 864	S-21
AD-251 008	S-22
AD-251 022	S-51
AD-251 139	S-46
AD-251 144	S-42
AD-251 176	S-9
AD-251 291	S-35
AD-251 310	S-36
AD-251 342	S-39
AD-251 350	S-40
AD-251 477	S-49
AD-251 529	S-49
AD-251 578	S-24
AD-251 608	S-20
AD-251 609	S-66
AD-251 652	S-29
AD-251 657	S-58
AD-251 662	S-68
AD-251 687	S-32
AD-251 732	S-80
AD-251 750	S-29
AD-251 753	S-73
AD-251 919	S-52
AD-251 976	S-73
AD-252 022	S-63
AD-252 112	S-74
AD-252 113	S-74
AD-252 121	S-33
AD-252 140	S-23
AD-252 176	S-19
AD-253 237	S-39
AD-252 291	S-71
AD-252 397	S-73
AD-252 485	S-26
AD-252 543	S-41
AD-252 548	S-49
AD-252 560	S-16
AD-252 561	S-50
AD-252 605	S-32
AD-252 669	S-74
AD-252 689	S-15
AD-252 692	S-78
AD-252 707	S-39
AD-252 806	S-52
AD-252 813	S-44
AD-252 834	S-56
AD-252 859	S-72
AD-252 997	S-33
AD-253 030	S-76
AD-253 052	S-78
AD-253 072	S-20
AD-253 075	S-72
AD-253 178	S-55
AD-253 179	S-56
AD-253 186	S-18
AD-253 229	S-50
AD-253 240	S-28
AD-253 242	S-51
AD-253 252	S-1
AD-253 274	S-79
AD-253 332	S-15
AD-253 340	S-75
AD-253 387	S-55
AD-253 424	S-55
AD-253 459	S-7
AD-253 479	S-7
AD-253 528	S-37
AD-253 712	S-6
AD-253 713	S-5
AD-253 714	S-3
AD-253 755	S-54
AD-253 756	S-56
AD-253 757	S-55
AD-253 786	S-41
AD-254 003L	S-58
AD-254 228	S-44
AD-254 300	S-8
AD-254 416	S-55
AD-254 512	S-66
AD-254 513	S-21
AD-254 704	S-45
AD-254 767	S-54
AD-254 768	S-57
AEDC-TN-60-207	S-50
AEDC-TN-60-222	S-50
AEDC-TN-60-223	S-50
AEDC-TN-61-8	S-49
AEDC-TN-61-23	S-49
AEDC-TN-61-24	S-49
AFBMD-8-11, 398	S-47
AFBMD-60-937	S-50
AFBMD-TN-60-6	S-50
AFCRC-TN-60-259	S-19
AFCRL-5	S-12
AFCRL-9	S-32
AFCRL-11	S-24
AFCRL-13	S-68
AFCRL-15	S-33
AFCRL-28(A)	S-29
AFCRL-28(B)	S-29
AFCRL-51	S-15
AFCRL-52	S-73
AFCRL-60	S-72
AFCRL-65	S-78
AFCRL-102	S-78
AFCRL-110	S-73
AFCRL-127	S-1
AFCRL-200	S-46
AFCRL-203	S-20
AFCRL-257	S-18
AFCRL-265	S-56
AFCRL-267	S-20
AFCRL-269	S-76
AFCRL-TN-60-298	S-20
AFCRL-TN-60-603	S-66
AFCRL-TN-60-612	S-17
AFCRL-TN-60-615	S-16

Number	Page
AFCRL-TN-60-641	S-16
AFCRL-TN-60-658	S-16
AFCRL-TN-60-811	S-43
AFCRL-TN-60-812	S-17
AFCRL-TN-60-813	S-17
AFCRL-TN-60-989	S-25
AFCRL-TN-60-1101	S-32
AFCRL-TN-60-1119	S-32
AFCRL-TN-60-1144	S-29
AFCRL-TN-60-1147	S-33
AFCRL-TN-60-1171	S-28
AFCRL-TN-60-1174	S-35
AFCRL-TR-60-421	S-65
AFCRL-TR-60-640	S-21
AFCRL-TR-60-1111	S-47
AFFTC-TR-60-62	S-41
AFMDC-TR-59-14 superseded	S-35
AFMDC-TR-60-24	S-35
AFMDC-TR-60-35	S-37
AFMDC-TR-59-6	S-30
AFMDC-TR-60-18	S-37
AFOSR-3	S-75
AFOSR-14	S-46
AFOSR-19	S-74
AFOSR-38	S-74
AFOSR-56	S-51
AFOSR-92	S-80
AFOSR-99	S-75
AFOSR-101	S-22
AFOSR-103	S-36
AFOSR-113	S-63
AFOSR-117	S-57
AFOSR-125	S-21
AFOSR-131	S-44
AFOSR-132	S-45
AFOSR-134	S-72
AFOSR-156	S-39
AFOSR-161	S-44
AFOSR-164	S-74
AFOSR-TN-59-456	S-51
AFOSR-TN-59-685	S-51
AFOSR-TN-59-691	S-45
AFOSR-TN-59-949	S-4
AFOSR-TN-59-973	S-7
AFOSR-TN-59-994	S-4
AFOSR-TN-59-999	S-6
AFOSR-TN-60-9	S-65
AFOSR-TN-60-704	S-74
AFOSR-TN-60-841	S-64
AFOSR-TN-60-842	S-64
AFOSR-TN-60-856	S-2
AFOSR-TN-60-954	S-60
AFOSR-TN-60-961	S-75
AFOSR-TN-60-1305	S-62
AFOSR-TN-60-1366	S-60
AFOSR-TN-60-1396	S-65
AFOSR-TN-60-1435	S-62
AFOSR-TN-60-1436	S-60
AFOSR-TN-60-1481	S-75
AFOSR-TN-60-1482	S-75
AFOSR-TR-59-48	S-8
AFSAM-60-32	S-6
AFSWC-TR-60-26	S-62
ALI C-60929	S-68
ALI C-62403	S-72
AMC-TR-60-7-667	S-40
AMRG PM-33	S-17
AMRG PM-39	S-17
ANL-5889 Addendum	S-11
ANL-5890	S-62
ANL-6206	S-57
ANL-6222	S-63
ANL-6230	S-57
ANL-6323	S-62
ANL-6332	S-60
APEX-586	S-58
APRL-TR-5954	S-43
ARF 2152-13	S-57
ARF 4132-12	S-78
ARL-TN-60-159	S-52
ARL-TN-60-164	S-52
ARL-TR-60-328	S-72
ARPA Order-24-59, Task 2	S-60
ARPA Order-24-59, Task 3	S-65
ARPA Order-120-60	S-78
ARTEMIS-7	S-19
ASI U-603	S-46
ASRDL-2117	S-24
ASRDL-2143	S-63
Avco RAD-TR-61-5	S-33
Avco RN-170	S-50
Bell-8111-933001	S-41
Bell-8111-933002	S-41
BMI-1513	S-54
BN-214	S-74
BN-223	S-74
BN-224	S-21
BuMed MR005.15-1003.1, R-4	S-21
BuPers TB-60-7	S-2
BuPers TB-60-10	S-2
BuPers TB-60-12	S-3
CAL CA-1172-S-1	S-25
CAL UB-1227-V-3	S-1
CCL-100	S-58
COLL CER-965	S-25
COO-223	S-9
CRDLR-3025	S-8
CU-17-60-ONR-266(20)	S-76
CU-19-60-Nonr-266(59)	S-44
CU-44-60-Nonr-266(33)	S-45
DAC SM-37627	S-52
DMIC-150	S-39
DMIC-M-88	S-56
DMIC-M-90	S-55
DMIC-M-91	S-54
DMIC-M-93	S-55
DMIC-M-94	S-55
DMIC-M-95	S-56
DMIC-M-96	S-55
DMIC-M-97	S-55
DMIC-M-98	S-54
DMIC-M-99	S-57
DMIC-M-100	S-57
DOFL TR-836	S-79
DOFL TR-865	S-26
DOFL TR-882	S-39
DOFL TR-917	S-41
DP-527	S-57
DP-574	S-61
DSR-7476	S-13
DTMB-1365	S-51
DTMB-1413	S-49
DTMB-1460	S-38
DTMB-1474	S-38
EDL-M122	S-27
EDL-M165	S-26
ERL-106	S-27
ERL-107	S-27
ERL-108	S-27
ERL-109	S-28
ERL-111	S-27
ESL-MIT-6873-IR-1, 2	S-39
ESL-MIT-6873-IR-3	S-40
ESL-MIT-6873-IR-4, 5	S-40
ESL-MIT-8060-R-3	S-36
ESL-MIT-8494-R-2	S-47
ETT-780	S-52
FI F-A1957	S-28
Forrestal (CVA-59)	S-38
FTRL-TOR-61-21	S-41
FZK-9-149	S-62
GAT-372	S-10
GMI-2173	S-56
GNE-57	S-76
Grant NSF G-3407	S-4
Grant PHS H-2962	S-6
Grant PHS HTS-5147	S-6
GRD RN-31	S-20
GRD RN-41	S-17
GRD RN-42	S-16
GRD RN-44	S-16
GRD RN-48	S-43
GRD RN-50	S-20
GTEL TR-60-704-104-204-205-208.4	S-29
HH ARD-238	S-38
HR-60-497	S-71
HW-59778(Rev.)	S-58
HW-61236 SUP 2	S-61
HW-63072	S-61
HW-67395	S-61
HW-67793	S-12
HW-68527	S-47
HW-68773	S-61
IDO-14549	S-10
IDO-16668	S-61
IDO-16675	S-61
IER-60-29	S-28
IER-60-291	S-45
IER-60-294	S-27
IER-60-296	S-27
IER-60-297	S-27
IER-60-299	S-28
IER-60-301	S-27
IER-60-326	S-28
IER-82-16	S-53
IER-155-1	S-77
IL T-159	S-47
IL T-192	S-29
IRL-145	S-20
IS-192	S-9
IST-2354-13-R	S-22
LA-2494	S-60
LAMS-2544	S-61
LL 47G-0013	S-30
LMSD 603 084	S-36
LMSD 703 071	S-77
LMSD 703 079	S-1
LMSD 703 088	S-36
LMSD 703 093	S-77
MIRP SC-03-91	S-16
ML(UM) 60-258	S-16
MRC-195	S-13
MRC(Materials)-R168	S-13
NAA-SR-4537	S-61
NAA-SR-5584	S-61
NAA-SR-5893	S-54
NADC-AC-6008	S-21
NADC-EL-6029	S-23
NADC-MA-6016	S-21
NAS-NS-3022	S-59
NAS-NS-3029	S-59
NAVWEPS-4308	S-43
NBS-TN-40-3	S-20
NCEL N-398	S-5
NCEL R-086	S-23
NLCO-826	S-59
NRCC-6257	S-20
NRCC-6264	S-22
NRCC LR-296	S-22
NRCC LR-301	S-20
NRCC MP-20A	S-42
NRL-5576	S-66
NRL-5598	S-21
ONR-8	S-57
OORR-157-...	S-56
OORR-841-...	S-10
OORR-913-1	S-45
OORR-1592....	S-13
OORR-1627-....	S-52
OORR-1879:1-C	S-12
OORR-2096:1	S-45
PA PRSR-9	S-42
PB 142 375 superseded	S-35
PB 147 114	S-35
PB 147 901	S-38
PB 148 880	S-11
PB 148 925	S-46
PB 148 939	S-3
PB 148 940	S-4
PB 148 973	S-76
PB 149 004	S-74
PB 149 077	S-80
PB 149 093	S-15
PB 149 173	S-47
PB 149 217	S-13
PB 149 228	S-18
PB 149 229	S-1
PB 149 300	S-73
PB 149 308	S-11
PB 149 323	S-60
PB 149 330	S-18
PB 149 356	S-18
PB 149 357	S-18
PB 149 439	S-24
PB 149 453	S-54
PB 149 524	S-79
PB 149 532	S-19
PB 149 533	S-34
PB 149 544	S-64
PB 149 557	S-64
PB 149 562	S-67
PB 149 564	S-48
PB 149 591	S-66
PB 149 743	S-17
PB 149 746	S-66
PB 149 779	S-19
PB 149 780	S-66
PB 149 793	S-78
PB 149 795	S-45
PB 149 796	S-53
PB 149 801	S-80
PB 149 802	S-43
PB 149 803	S-12
PB 149 814	S-34
PB 149 833	S-5
PB 149 836	S-70
PB 149 840	S-19
PB 149 841	S-36
PB 149 842	S-77
PB 149 843	S-3
PB 149 882	S-38
PB 149 886	S-70
PB 149 900	S-2
PB 149 907	S-5
PB 149 950	S-24
PB 149 951	S-44
PB 149 965	S-44
PB 149 981	S-4
PB 150 032	S-13
PB 150 102	S-45
PB 150 113	S-48
PB 150 134	S-14
PB 150 135	S-14
PB 150 142	S-46
PB 150 192	S-80
PB 150 202	S-48
PB 150 205	S-45
PB 150 246	S-71
PB 150 264	S-41
PB 150 270	S-10
PB 150 375	S-44
PB 150 379	S-44
PB 150 385	S-26
PB 150 389	S-63
PB 150 434	S-4
PB 150 512	S-27
PB 150 513	S-27
PB 150 530	S-67
PB 150 533	S-15
PB 150 559	S-71
PB 150 625	S-53
PB 150 630	S-19
PB 150 655	S-34
PB 150 791	S-28
PB 150 840	S-22
PB 150 841	S-22
PB 150 884	S-63
PB 150 995	S-76
PB 151 109	S-39
PB 151 399-3	S-20
PB 152 043	S-57
PB 152 234	S-27
PB 152 235	S-28
PB 152 400	S-27
PB 152 407	S-48
PB 152 459	S-52
PB 152 600	S-8
PB 152 601	S-54
PB 152 634	S-64
PB 152 635	S-64
PB 152 636	S-75
PB 152 665	S-33
PB 152 717	S-66
PB 153 130	S-59
PB 153 176	S-52
PB 153 471	S-52
PB 153 474	S-72
PB 153 761	S-2
PB 153 766	S-72
PB 153 773	S-47
PB 153 815	S-10
PB 153 816	S-11
PB 153 817	S-58
PB 153 921	S-67
PB 153 925	S-5
PB 153 956	S-42
PB 153 957	S-42
PB 153 961	S-30
PB 153 964	S-23
PB 153 968	S-29
PB 153 969	S-74
PB 153 970	S-69
PB 153 972	S-68
PB 153 974	S-21
PB 153 985	S-69
PB 153 991	S-68
PB 153 992	S-70
PB 153 993	S-68
PB 153 994	S-69
PB 153 996	S-69
PB 153 997	S-69
PB 153 998	S-69
PB 153 999	S-70
PB 154 000	S-70
PB 154 024	S-68
PB 154 030	S-67
PB 154 032	S-67
PB 154 035	S-67
PB 154 037	S-68
PB 154 059	S-17
PB 154 060	S-17

Number	Page
PB 154 065	S-75
PB 154 066	S-75
PB 154 068	S-5
PB 154 069	S-65
PB 154 073	S-42
PB 154 085	S-65
PB 154 086	S-60
PB 154 096	S-11
PB 154 105	S-11
PB 154 106	S-12
PB 154 133	S-38
PB 154 134	S-2
PB 154 135	S-2
PB 154 136	S-3
PB 154 137	S-62
PB 154 138	S-60
PB 154 139	S-62
PB 154 140	S-60
PB 154 141	S-16
PB 154 145	S-77
PB 154 146	S-36
PB 154 147	S-36
PB 154 148	S-77
PB 154 159	S-22
PB 154 162	S-16
PB 154 164	S-58
PB 154 192	S-30
PB 154 193	S-78
PB 154 202	S-31
PB 154 203	S-24
PB 154 204	S-63
PB 154 223	S-8
PB 154 225	S-6
PB 154 226	S-8
PB 154 227	S-35
PB 154 229	S-37
PB 154 230	S-50
PB 154 246	S-41
PB 154 252	S-12
PB 154 253	S-71
PB 154 270	S-38
PB 154 271	S-16
PB 154 274	S-65
PB 154 277	S-65
PB 154 300	S-37
PB 154 307	S-9
PB 154 310	S-46
PB 154 341	S-21
PB 154 343	S-32
PB 154 345	S-75
PB 154 351	S-24
PB 154 354	S-77
PB 154 359	S-33
PB 154 360	S-21
PB 154 421	S-76
PB 154 482	S-32
PB 154 485	S-59
PB 154 492	S-43
PB 154 505	S-9
PB 154 521	S-23
PB 154 552	S-51
PB 154 577 canceled	S-43
PB 154 581	S-52
PB 154 602 canceled	S-2
PB 154 739	S-24
PB 154 742	S-25
PB 154 776	S-22
PB 154 777	S-36
PB 154 781	S-46
PB 154 797	S-12
PB 154 831	S-35
PB 154 832	S-73
PB 154 850	S-63
PB 154 878	S-66
PB 154 880	S-20
PB 154 881	S-20
PB 154 885	S-17
PB 154 886	S-16
PB 154 887	S-21
PB 154 890	S-43
PB 154 891	S-29
PB 154 892	S-29
PB 154 894 canceled	S-1
PB 154 901	S-58
PB 154 904	S-47
PB 154 905	S-32
PB 154 906	S-68
PB 154 913	S-73
PB 154 916	S-57
PB 154 920	S-49
PB 154 921	S-49
PB 154 939	S-31
PB 154 940	S-30
PB 154 941	S-26
PB 154 942	S-31
PB 154 943	S-79
PB 154 944	S-31
PB 154 945	S-26
PB 154 946	S-56
PB 154 947	S-45
PB 154 948	S-45
PB 154 949	S-13
PB 154 950	S-51
PB 154 951	S-72
PB 154 952	S-4
PB 154 953	S-7
PB 154 954	S-6
PB 154 981	S-71
PB 154 995	S-80
PB 155 037	S-33
PB 155 040	S-33
PB 155 054	S-74
PB 155 055	S-74
PB 155 064	S-18
PB 155 065	S-31
PB 155 066	S-35
PB 155 067	S-25
PB 155 070	S-8
PB 155 071	S-7
PB 155 072	S-30
PB 155 074	S-13
PB 155 075	S-14
PB 155 076	S-45
PB 155 077	S-4
PB 155 078	S-51
PB 155 093	S-23
PB 155 094	S-8
PB 155 098	S-73
PB 155 113	S-32
PB 155 122	S-19
PB 155 158	S-14
PB 155 161	S-26
PB 155 162	S-27
PB 155 163	S-72
PB 155 164	S-40
PB 155 165	S-10
PB 155 166	S-52
PB 155 167	S-28
PB 155 168	S-29
PB 155 169	S-35
PB 155 179	S-74
PB 155 191	S-56
PB 155 194	S-39
PB 155 196	S-15
PB 155 205	S-78
PB 155 217	S-72
PB 155 221	S-16
PB 155 279	S-41
PB 155 282	S-50
PB 155 298 canceled	S-40
PB 155 303	S-72
PB 155 306	S-44
PB 155 348	S-49
PB 155 352	S-78
PB 155 353	S-76
PB 155 356	S-79
PB 155 361	S-18
PB 155 390	S-28
PB 155 392	S-51
PB 155 411	S-50
PB 155 418	S-75
PB 155 439	S-15
PB 155 455	S-1
PB 155 461	S-7
PB 155 462	S-7
PB 155 464	S-42
PB 155 469	S-20
PB 155 516	S-39
PB 155 517	S-40
PB 155 518	S-40
PB 155 541	S-6
PB 155 542	S-5
PB 155 543	S-3
PB 155 571	S-47
PB 155 580	S-41
PB 155 617	S-26
PB 155 631	S-44
PB 155 720	S-6
PB 155 764	S-17
PB 155 765	S-17
PB 155 781	S-20
PB 155 842	S-62
PB 155 881	S-45
PB 155 921	S-42
PB 155 922	S-22
PB 156 090	S-49
PB 156 091	S-25
PB 156 092	S-62
PB 156 093	S-25
PB 156 094	S-77
PB 156 095	S-50
PB 156 124	S-1
PB 161 238	S-56
PB 161 240	S-55
PB 161 241	S-54
PB 161 243	S-55
PB 161 244	S-55
PB 161 245	S-56
PB 161 246	S-55
PB 161 247	S-55
PB 161 248	S-54
PB 161 249	S-57
PB 161 250	S-57
PB 161 535 (Rev. 2)	S-36
PB 161 671	S-79
PB 171 110	S-57
PB 171 319	S-80
PB 171 357	S-37
PB 171 537	S-58
PB 171 540	S-39
PB 171 671-1	S-53
PB 171 671-2-7	S-53
PB 171 806	S-23
PB 171 811	S-43
PB 171 812	S-2
PB 171 813	S-1
PB 171 814	S-40
PIB-596	S-31
PIB-638	S-31
PIBMRI-668-58	S-31
PIBMRI-710-58	S-31
PIBMRI-880-60	S-78
Poulter TR-011-60	S-57
PPL-TR-60-9(185)	S-74
PPL-TR-60-15 (160)	S-74
PRA-60-37	S-5
Proj. 3-99-00-500	S-16
PU AEL-529	S-52
QFCIAF S-550, R-7	S-9
R59SD340	S-77
R61SD004	S-77
RADC-TN-59-127	S-18
RADC-TN-59-148	S-31
RADC-TN-60-226	S-33
RADC-TR-58-91	S-25
RADC-TR-59-30	S-35
RADC-TR-59-67	S-7
RADC-TR-59-96	S-25
RADC-TR-59-127	S-35
Ray S-229	S-73
Ray S-242	S-72
RLES-AST-4435-104-60U	S-66
S/TD-1876	S-39
SCR-245	S-9
SCTM-67-61-13	S-37
SCTM-81-61(24)	S-33
SCTM-96-61(73)	S-64
SEL TR-1506-2	S-48
SEL TR-1552-1	S-48
SEL TR-2104-1	S-48
SEL TR-2106-1	S-34
SIO Ref-57-43	S-69
SIO Ref-57-47	S-68
SIO Ref-58-35	S-69
SIO Ref-58-42	S-68
SIO Ref-58-43	S-70
SIO Ref-58-46	S-68
SIO Ref-58-59	S-69
SIO Ref-58-79	S-69
SIO Ref-58-80	S-69
SIO Ref-59-2	S-69
SIO Ref-59-7	S-70
SIO Ref-59-10	S-70
SIO Ref-60-26	S-19
SIO Ref-60-41	S-64
SIT-P2(10/60)	S-75
SIT-P24a(11/60)	S-75
Sperry-LJ-1260-0001-8	S-23
Squid CAL-81-P	S-67
SRI-2836	S-15
SRI-2912	S-57
SRI-2919	S-37
SRL(LI) RS-29.14	S-64
SRL(LI) RS-29.15	S-64
SRL(LI) RS-29.16	S-75
TAM-170	S-71
TAMC Ref-60-11A	S-19
TED ADC EL-52043, FR, pt. 2	S-23
TID-3561	S-61
TID-7016(Rev. 1)	S-60
TID-7609	S-61
TID-8210	S-61
TV-2	S-21
UCLA AR-10	S-2
UCLA DE-60-23	S-2
UCLA DE-60-64	S-44
UCRL-6251	S-59
UCRL-6319	S-59
UCRL-8982	S-62
UCRL-9203	S-65
UCRL-9419	S-9
UCRL-9563	S-59
UMRI-03105	S-45
UMRI-03114	S-64
UMRI-0953-1-F	S-53
UMRI-2262-179-T	S-31
UMRI-2718-7-F	S-9
UMRI-2764-3-T	S-78
UMRI-2794-13-T	S-45
UMRI-3648-3-T	S-78
USCEC-83-202	S-75
USNRDL-TR-368	S-62
USNRDL-TR-413	S-59
Varian ER-232-1	S-35
W-J 60-372R1	S-35
WADC-TR-59-792	S-25
WADD-TR-60-141	S-42
WAPD-239	S-54
WAPD-BT-22	S-61
WAPD-MRP-91	S-61
WAPD-TM-243	S-46
WAPD-TM-269	S-47
WCAP-1428	S-61
WHOI Ref. 60-30	S-38
WRL-403FD449-R6	S-35
Y-1347	S-60

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- Management and business aids
- Establishing a new business

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- Development and maintenance of markets
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- Marketing and distribution statistics

PRODUCTION

- Modernization of plant processes and other technological aids
- Development of new products
- Government-owned patents for free license
- Commodity standards

FOREIGN TRADE AND INVESTMENT

- Tariff and exchange regulations
- Import and export quotas, licensing regulations
- Statistics on imports and exports
- Investment and trade opportunities abroad
- Economic conditions in foreign countries

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